Operation and Installation manual

SOLIVIA 6.0 EU T4 TL
SOLIVIA 8.0 EU T4 TL
SOLIVIA 10 EU T4 TL
SOLIVIA 12 EU T4 TL
SOLIVIA 15 EU G4 TL
SOLIVIA 20 EU G4 TL
SOLIVIA 30 EU T4 TL

This manual is subject to change.

Please check our website at www.solar-inverter.com

for the most up-to-date manual version.

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1. General Safety Instructions

DANGER

Risk of death by electrocution

Potentially fatal voltage is applied to the solar inverter during operation. This potentially fatal voltage is still present for five minutes after all power sources have been disconnected.

- ► Never open the solar inverter.
- ► Always disconnect the solar inverter from power before installation, open the DC isolating switch and make sure neither can be accidentally reconnected.
- ► Wait at least five minutes until the capacitors have discharged.

DANGER

Risk of death or serious injury from electrocution

Potentially fatal voltage may be applied to the DC connections of the solar inverter.

- ► Never disconnect the PV modules when the solar inverter is powered.
- ► First switch off the grid connection so that the solar inverter cannot feed energy into the grid.
- ► Then open the DC isolating switch.
- ► Make sure the DC connections cannot be accidentally touched.

- The solar inverter can be safely and normally operated if installed and used in accordance with this manual (see IEC 62109-5.3.3). Delta Energy Systems is not responsible for damage incurred by failure to observe the installation and operating instructions in this manual. For this reason, be sure to observe and follow all instructions!
- Installation and commissioning may only be performed by qualified electricians using the installation and commissioning instructions found in this manual.
- The solar inverter must be disconnected from power and the PV modules before any work on it can be performed.
- The solar inverter has a high leakage current value. The ground wire **must** be connected before commissioning.
- Do not remove any warning signs that the manufacturer has installed on the solar inverter.
- Improper handling of the solar inverter my result in physical injury and damage to property. For this reason, observe and follow all general safety instructions and warnings.
- The solar inverter contains no components that must be maintained or repaired by the operator or installer. All repairs must be performed by Delta Energy Systems. Opening the cover will void the warranty.
- Do not disconnect any cables when the solar inverter is powered due to risk of a fault arc.
- To prevent lightning strikes, follow the relevant regulations applicable in your country.
- The surface of the solar inverter can become very hot.

- The solar inverter is very heavy. The solar inverter must be lifted and carried by at least two people.
- Only devices in compliance with SELV (EN 69050) may be connected to the RS485 and USB interfaces.
- All connections must be sufficiently insulated in order to comply with the IP65 protection rating. Unused connections must be closed by placing cover caps on the solar inverter.

2. General Information

2.1 About this Manual

This manual provides the detail information for the specification, installation procedures and all related functional settings of the solar inverter model.
Installation technicians must be well-trained and qualified for installing solar system and must follow all the safety instruction and installation procedures.

2.2 Safety Symbols & Instruction

CAUTION!
Machine and equipment damage may occur if this hazardous situation is not avoided

WARNING!
Death and serious injury may occur if this hazardous situation is not avoided

DANGER!
Death and serious injury will occur if this hazardous situation is not avoided

WARNING! BURN HAZARD
The enclosure temperature may exceed 70° C while inverter is in operation. A dangerous burn hazard is present in this situation. Please do not touch!

2.3 Validity

This user manual describes the installation procedures, maintenance, technical data and safety instruction of the specified solar inverter models under the DELTA brand.

The software version of your inverter is found on the inverter display. Please find more information in section 7.35 “Inverter Information.”

2.4 Product Description

The SOLIVIA TL inverters are 3 phase grid-tied solar inverters with reactive power control. These devices convert direct current (DC) electricity from photovoltaic power collected from PV arrays into 3 phase alternating current (AC) to feed the excess capacity back to the local mains electrical grid. Using cutting-edge technology allows a wide voltage input range (250~1000 V) and high performance efficiency based on a user-friendly operation design. In addition, special DSP (Digital Signal Processor) design decreases the circuit complication and electronic components. Please note that this device does not support off-grid function. The following are the key features of SOLIVIA TL series 3 phase grid-tied solar inverters.

Key Features

- Power Rating: 6 / 8 / 10 / 12 / 15 / 20 / 30 kVA
- Power Balancing (33/67) in asymmetrical dc loading situations
- 3-Phase (3-Phase + N + PE), Grid-tie, Transformerless solar inverter
- Maximum efficiency: up to 98.2 %
- Europe efficiency: up to 97.8 %
- Reactive power capability (Cap 0.80 - Ind 0.80)
- Low input current harmonic distortion (THD < 3%) @ full load
- 2 MPP Trackers
- Record up to 30 event logs.
- 5” LCD display
- EPO

The SOLIVIA TL inverters comply with the latest country regulations and standards. Please see the list on the website www.solar-inverter.com for the complete list of compliance standards.

2.5 Application & Intended Use

The operation of the solar inverter is as shown as in the figure 2.1. In order to save energy and electricity, solar inverters convert the DC input power supplied from the PV array into three-phase AC output power to the grid.

NOTE

Languages supported: English, Italian, French, German, Dutch, Spanish

The solar power inverter may only be used as intended.

Proper use of the solar power inverter meets the following criteria:

- Use in stationary PV systems connected to the local power grid for converting the direct current in the PV system to alternating current and feeding it into the grid
- Use within the specified power range (see Sec. 12.1 - Technical Specifications) and under the specified ambient conditions (indoor area or covered outdoor area with up to IP65)

Any of the following uses of the solar power inverter is considered improper:

- Isolated operation: The solar power inverter has anti-islanding and other monitoring features.
- Use in mobile PV systems.

2.6 Additional Information

For more detailed information about the SOLIVIA TL series or other related product information, please visit the website at http://www.solar-inverter.com for more support.

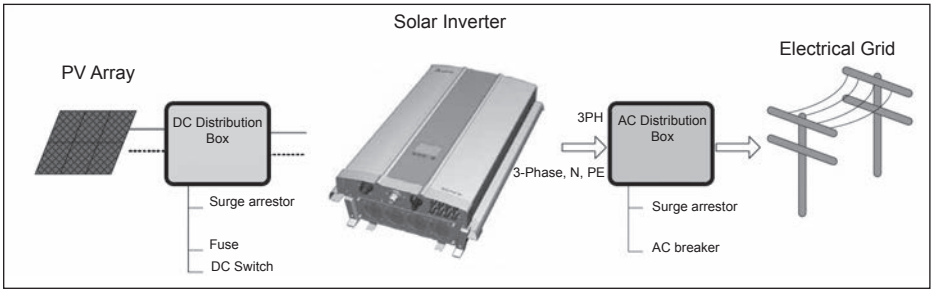


Figure 2.1.: Solar Inverter System Operation Illustration

2.7 Monitoring

The SOLIVIA TL inverters include a display for monitoring performance on location. Remote monitoring is also an option for the TL series inverters with Solar Log and Meteocontrol as well as Delta's own monitoring solution, SOLIVIA Monitor G2. Please contact your Delta supplier for more information on these remote monitoring options.

SOLIVIA Monitor G2 ensures reliable operation and maximum performance of PV systems. The system is compatible with all SOLIVIA String Inverter models from Delta. The all-in-one solution is made up of the SOLIVIA GW M1 G2, a gateway that acts as an interface, and an online portal that is available to users at http://monitoring.solar-inverter.com. Both real-time data reports and historical data statistics can be generated and exported as a CSV or Excel file. Automated alert messages notify the operator and ensure that the solar investment pays off. The installer also has the opportunity to manage its customers' systems in order to gain a quick overview of the system status at all times. What's more, the user receives information on the weather and also the latest news via the integrated news feed.

For more information about technical features and functions, please refer to the company website at the following link: http://www.solar-inverter.com/eu/en/SOLIVIA-monitoring-system.htm.

3. Preparing for Installation

3.1 Instruction before Installing

Due to the variety of user installation environments, reading the manual thoroughly before installation is strongly recommended. All the installation and start-up procedures must be undertaken by a professional and well-trained technician.

3.2 Checking the Package

There might be some unpredictable situations during transportation. Please check if there is any damage to the cardboard carton. After opening the package, please check both the outer case and inner part of this inverter as below.

1. Check the right side on the inverter case to ensure the model number and the specification is the same with the model you have purchased.
2. Check if there are any loose components.
3. Check if all the accessories are in the package, the standard accessories are listed in the below table:

Item	Quantity	Description
Solar Inverte	1	6 kVA, 8 kVA, 10 kVA, 12 kVA, 15 kVA, 20 kVA, or 30 kVA solar inverter
User Manual	1	User installation and operation instructions
AC Plug	1	Connector for AC connection
Mounting Bracket	1	Bracket to install the inverter on the wall

Table 3.1.: Packing List

NOTE

When there is outer or inner damage on the inverter or there is any missing or damaged standard accessories, please contact your inverter supplier for support.

3.3 Unpacking

1. Open the top of the cardboard box as shown in the figure below.
2. Remove the top packing material after opening the box.
3. Lift the Inverter out of the package and save the packaging in case of return.

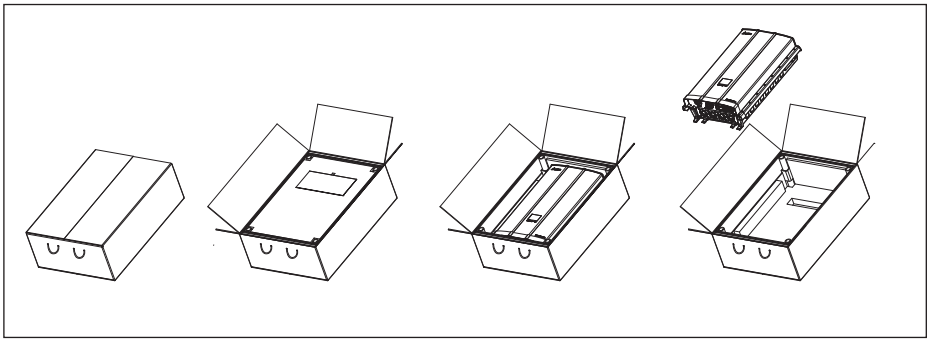


Figure 3.1.: Unpacking Process

3.4 Identify the Inverter

User can identify the model number by the information on the product label. The model number, specification as well as the series no. is specified on the product label. In regard to the label location, please refer to the below figure.

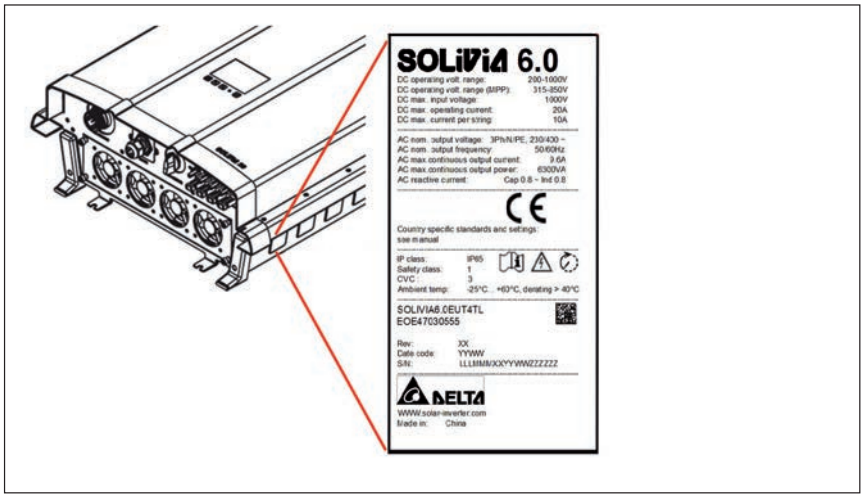


Figure 3.2.: The Type Label 6.0 TL

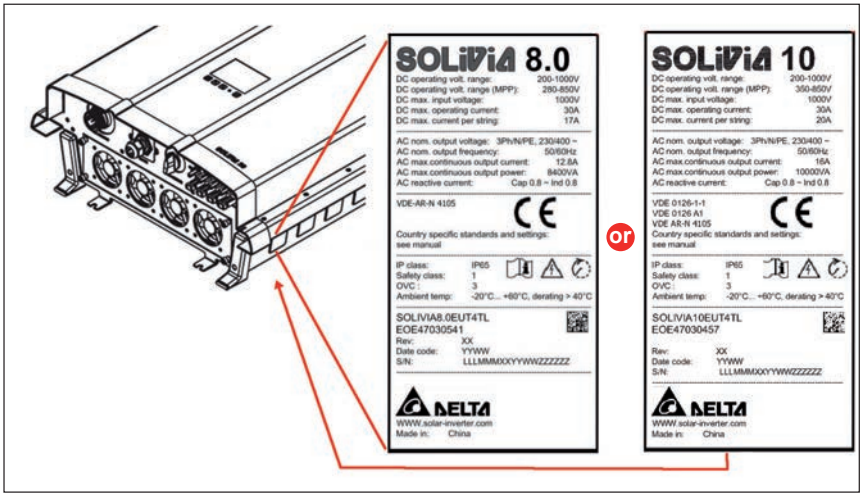


Figure 3.3.: The Type Label 8.0 TL and 10 TL

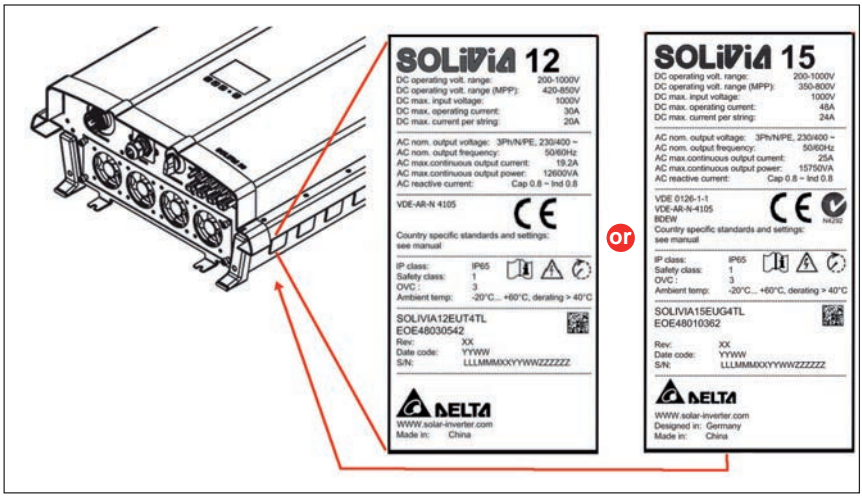


Figure 3.4.: The Type Label 12 TL and 15 TL

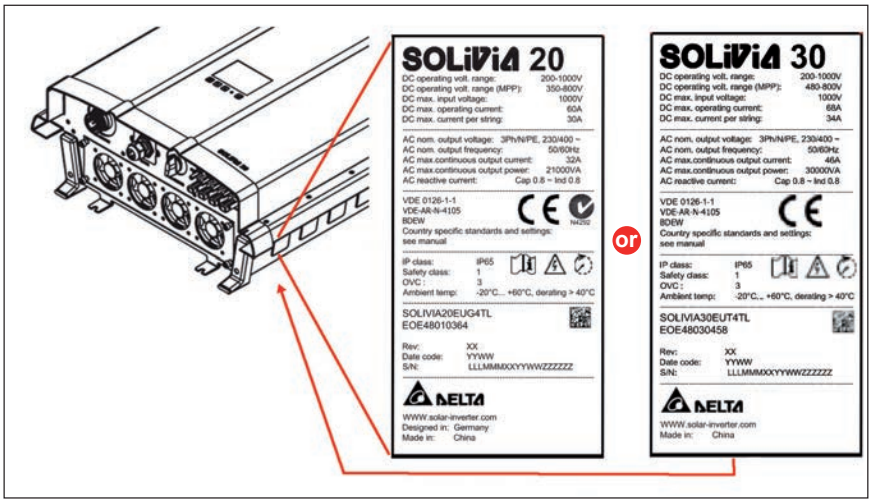


Figure 3.5.: The Type Label 20 TL and 30 TL

4. Product Overview

4.1 Dimensions SOLIVIA 6.0 TL / 8.0 TL / 10 TL / 12 TL

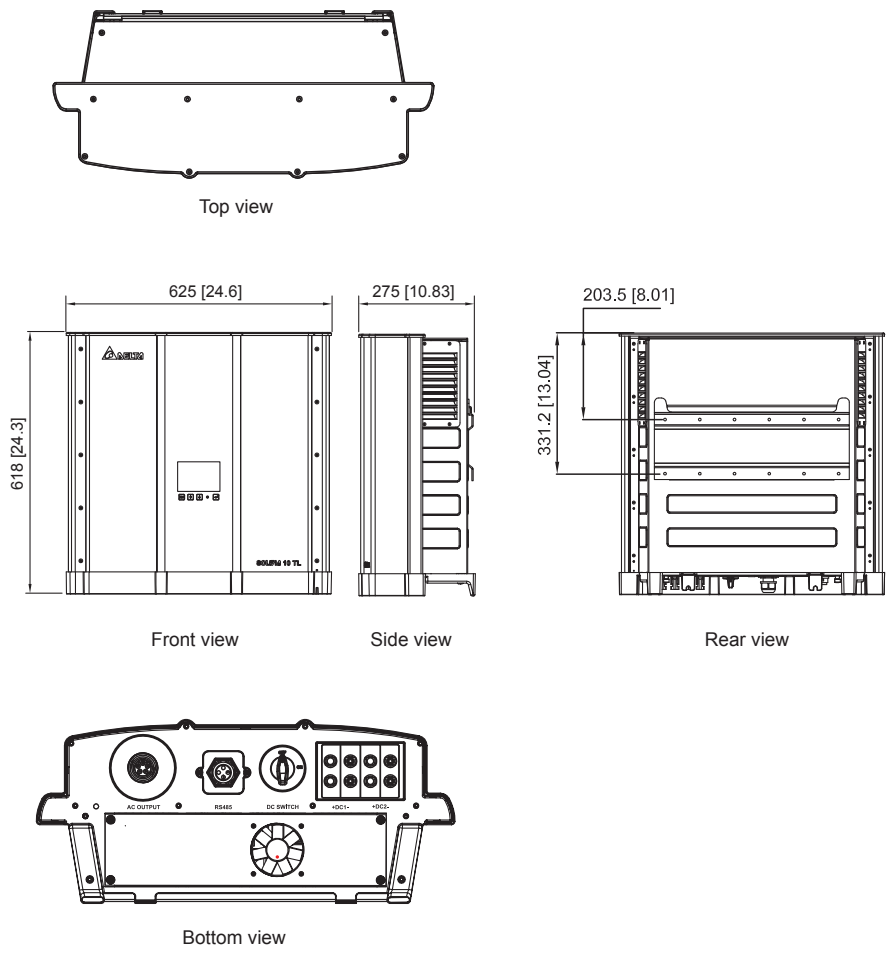


Figure 4.1.: Dimensions of SOLIVIA 6.0 TL / 8.0 TL / 10 TL / 12 TL

4.2 Dimensions SOLIVIA 15 TL, 20 TL, 30 TL

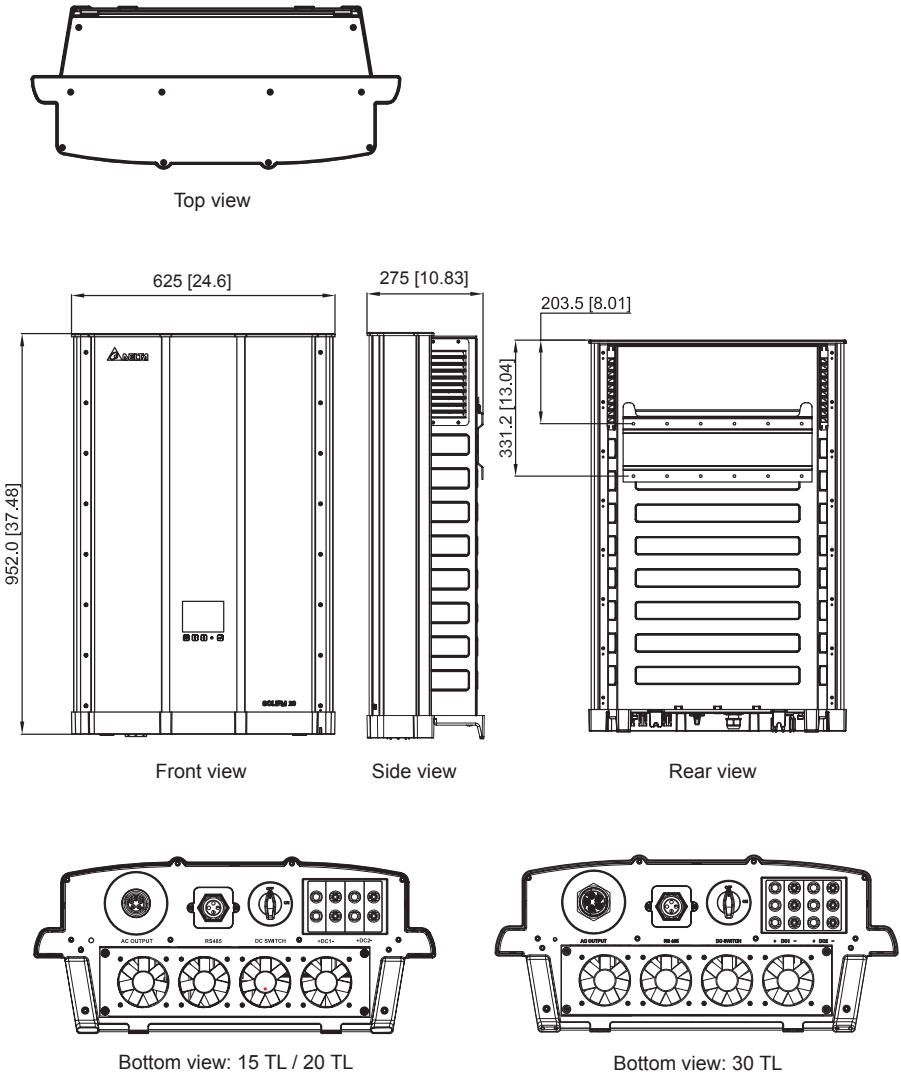


Figure 4.2.: Dimensions of SOLIVIA 15 TL / 20 TL / 30 TL

4.3 Function Introduction

Inverter exterior features are shown on figure 4.3 and 4.4, and a more detailed description is found in the sections from 4.3.1 to 4.3.3

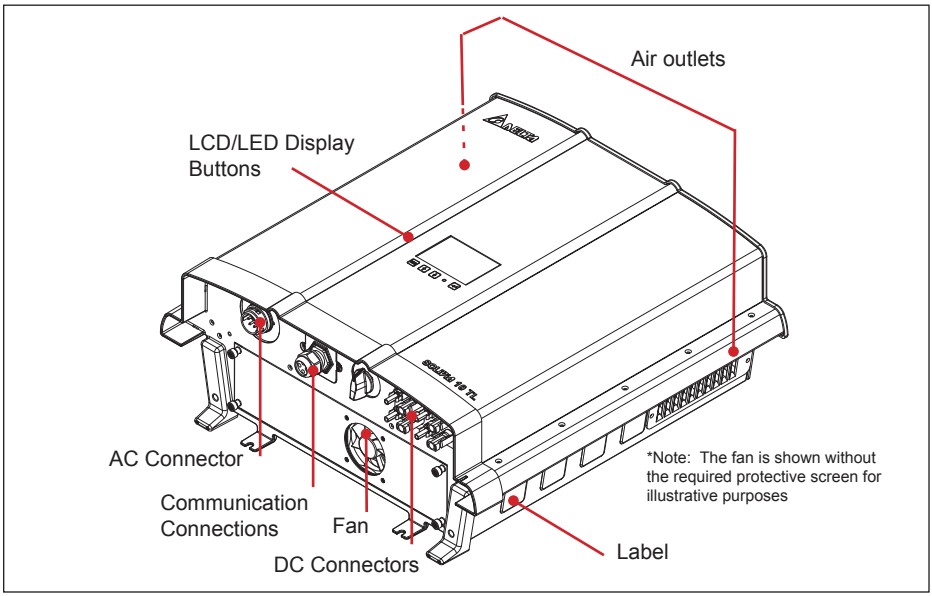


Figure 4.3.: 6.0 TL / 8.0 TL / 10 TL / 12 TL Inverter Exterior View

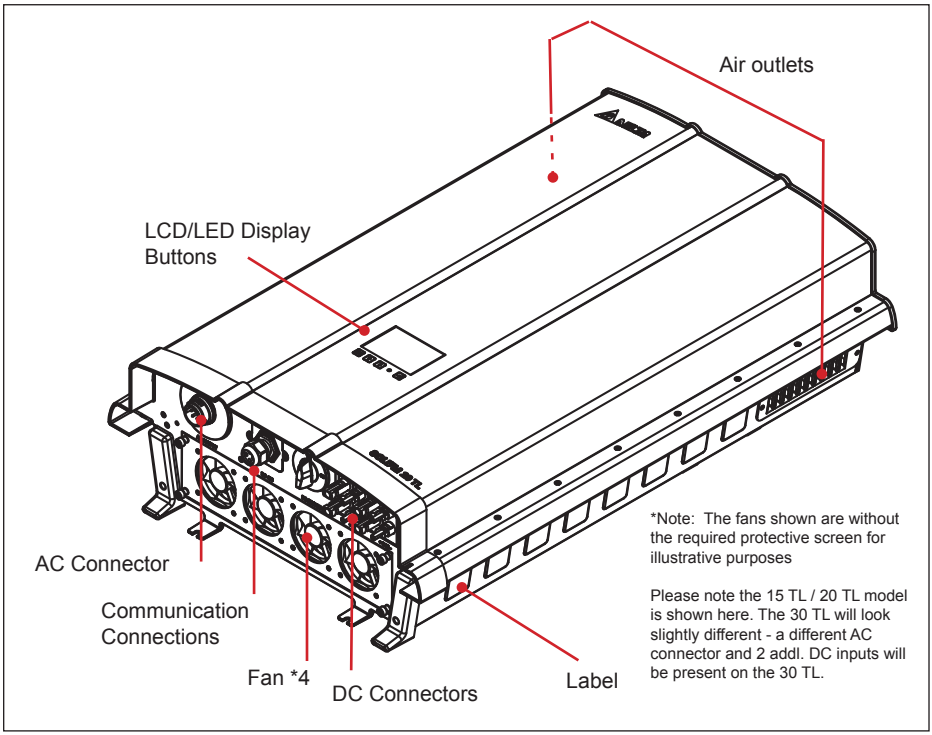


Figure 4.4.: 15 TL / 20 TL / 30 TL Inverter Exterior View

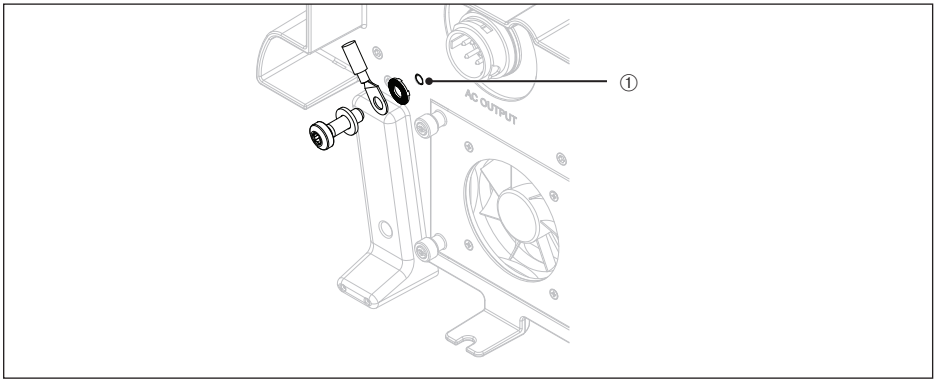


Figure 4.5.: Grounding Kit

The chassis has a predrilled hole ① to accept a grounding screw as shown. The maximum torque of the M6 grounding screw is 4.4 Nm. There is a 15 mm diameter unpainted surface around the center of the ground screw hole that allows for a solid ground connection when installing the grounding kit.

4.3.1 LCD Display and Buttons

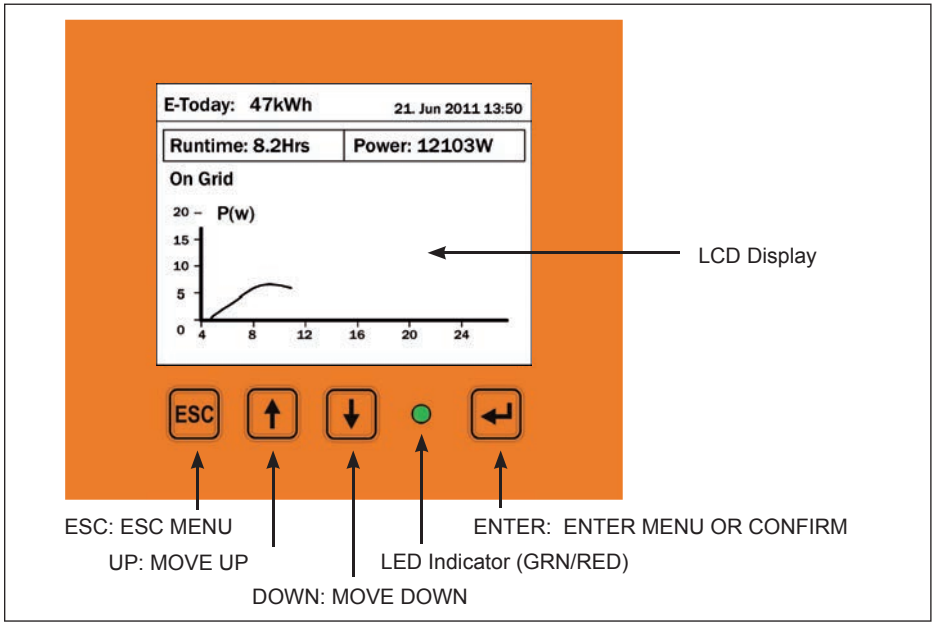


Figure 4.6.: LCD Display and Control Panel

4.3.2 Inverter Input/Output Interface

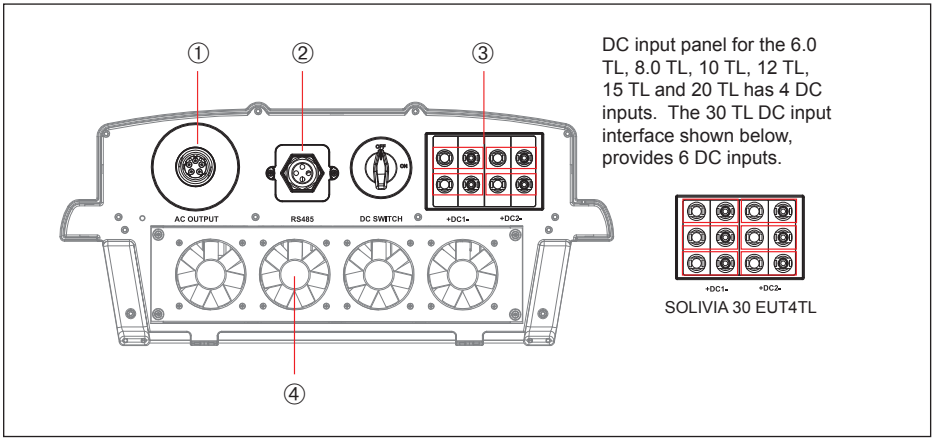


Figure 4.7.: Input/Output Interface

No.	Designation	Description
①	AC connector	400 V_{AC} for 6.0 / 8.0 / 10 / 12 / 15 / 20 TL ; 500 V_{AC} for 30 TL
②	Communication	2 × RS485, 1 × EPO, 2 × Dry contact
③	DC connector	4 Strings (6.0 TL / 8.0 TL / 10 TL / 12 TL / 15 TL / 20 TL), 6 Strings (30 TL)
④	Fans	4 Fans (6.0 TL / 8.0 TL / 10 TL / 12 TL model with only one fan)

NOTE

The fans shown are without the required protective screen for illustrative purposes.

4.3.3 Air outlet

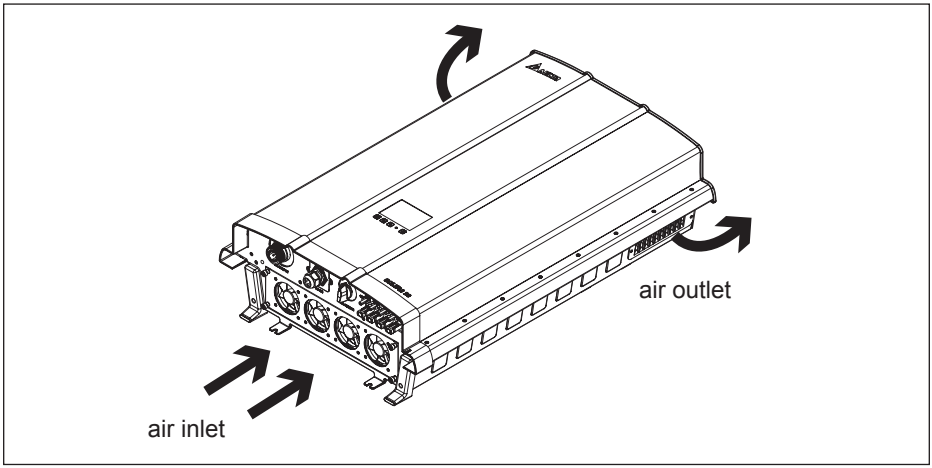


Figure 4.8.: Air Outlet Illustration

There are 4 fans in the bottom section of the inverter and all fans work synchronously. If any one fan locks up or is defective, it will cause a fan failure and power derating. If you suspect that there is a problem with a fan please call the Delta support hotline.

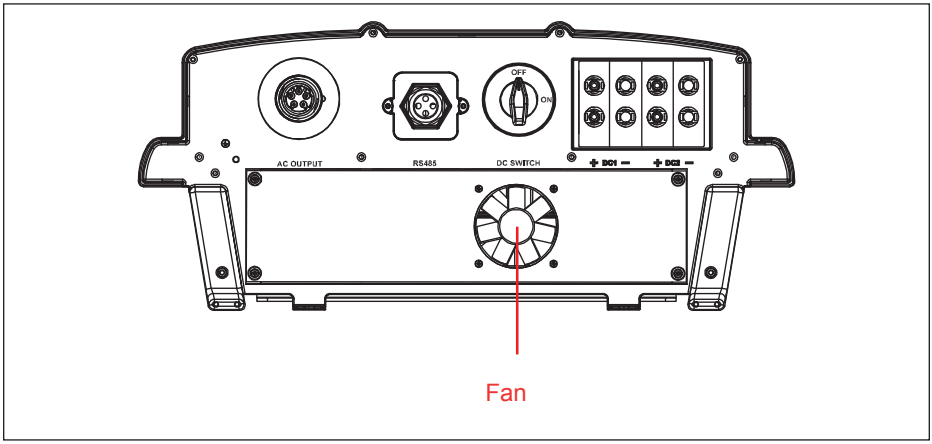


Figure 4.9.: Fan Control 6.0 TL, 8.0 TL, 10 TL and 12 TL

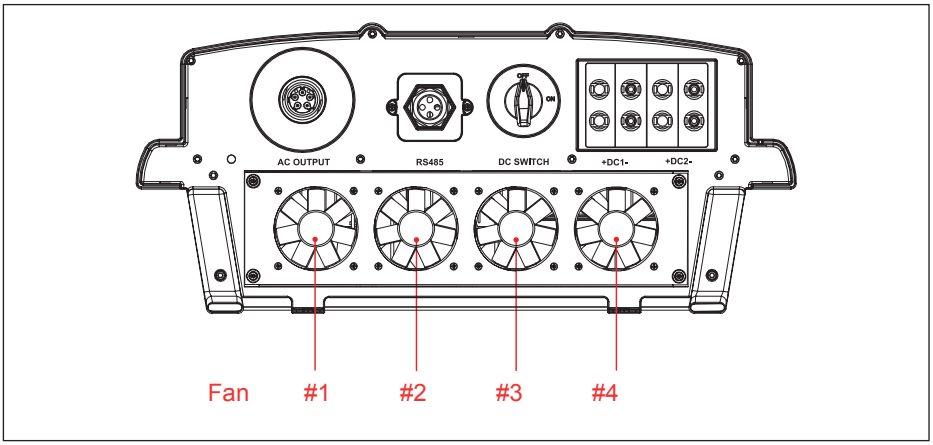


Figure 4.10.: Fan Control 15 TL and 20 TL

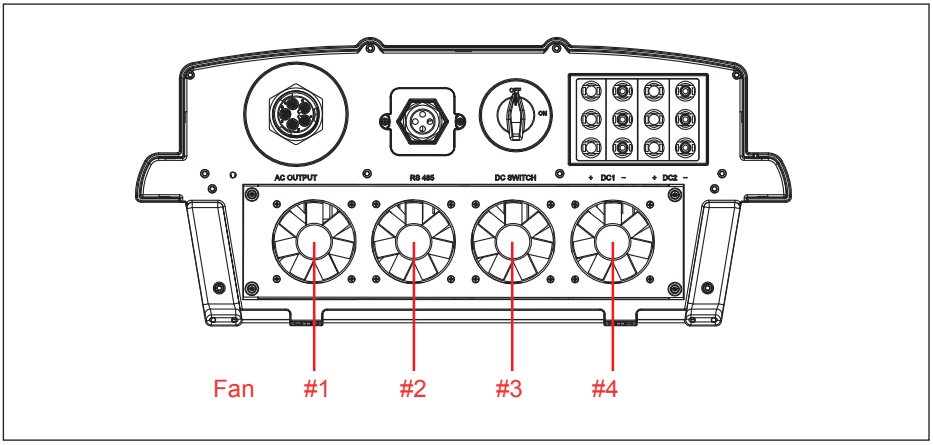


Figure 4.11.: Fan Control 30 TL

5. Installation

5.1 Installing Location

The SOLIVIA TL inverters can be installed indoors and in protected outdoor areas due to its enclosure protection classes IP65 and IP55. See the figure 5.1 for further explanation of the protection classes.

WARNING

Death and serious injury may occur if the following instructions are not carefully followed

- ► Do not install the unit near/on flammable objects.
- ► Do not install the unit at a location that people can gain entry/touch easily.
- ► Mount the unit tightly onto a solid/ smooth wall.
- ► In order to ensure the safety of installers, there should be at least two people to handle the installation.
- ► When moving the SOLIVIA TL, installer should not stand under material handling machines.
- ► Dusty conditions can impair the unit's performance

WARNING

- ► According to the Australian/New Zealand standard AS/NZS 5033:2005, PV arrays for installation on domestic dwellings should not have a maximum voltage greater than 600 V. For non-domestic installations where the PV array maximum voltage exceeds 600 V, the entire PV array and associated wiring and protection, should have restricted access, only accessible to authorized personnel.

CAUTION

Machine and equipment damage may occur.

- ► Do not install the unit at a location that has direct exposure to sunlight.

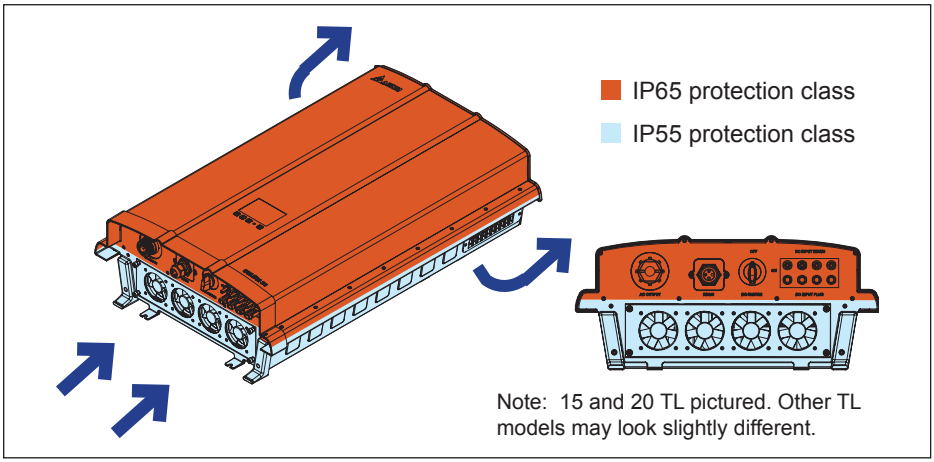


Figure 5.1.: Protection classes

NOTE

The fans shown are without the required protective screen for illustrative purposes.

The upper section of the inverter, shown in the darker tone above, is sealed from the lower section and rated at IP65 enclosure protection. The lower section of the inverter, containing the cooling mechanisms, is rated at IP55 enclosure protection.

5.2 Mounting

This unit utilizes a wall mounting system. Please ensure the installation is perpendicular and with the AC plug at the bottom. Do not install the device on a slanted wall. The dimensions of the mounting bracket are shown in the following figures. There are 12 pcs. of M6 screws required for attaching the mounting plate to the wall. Attach the mounting plate securely to the wall, before attaching the inverter on the mounting plate.

NOTE

Please ensure you are using the correct fastener for the material you are attaching the inverter mounting plate to.

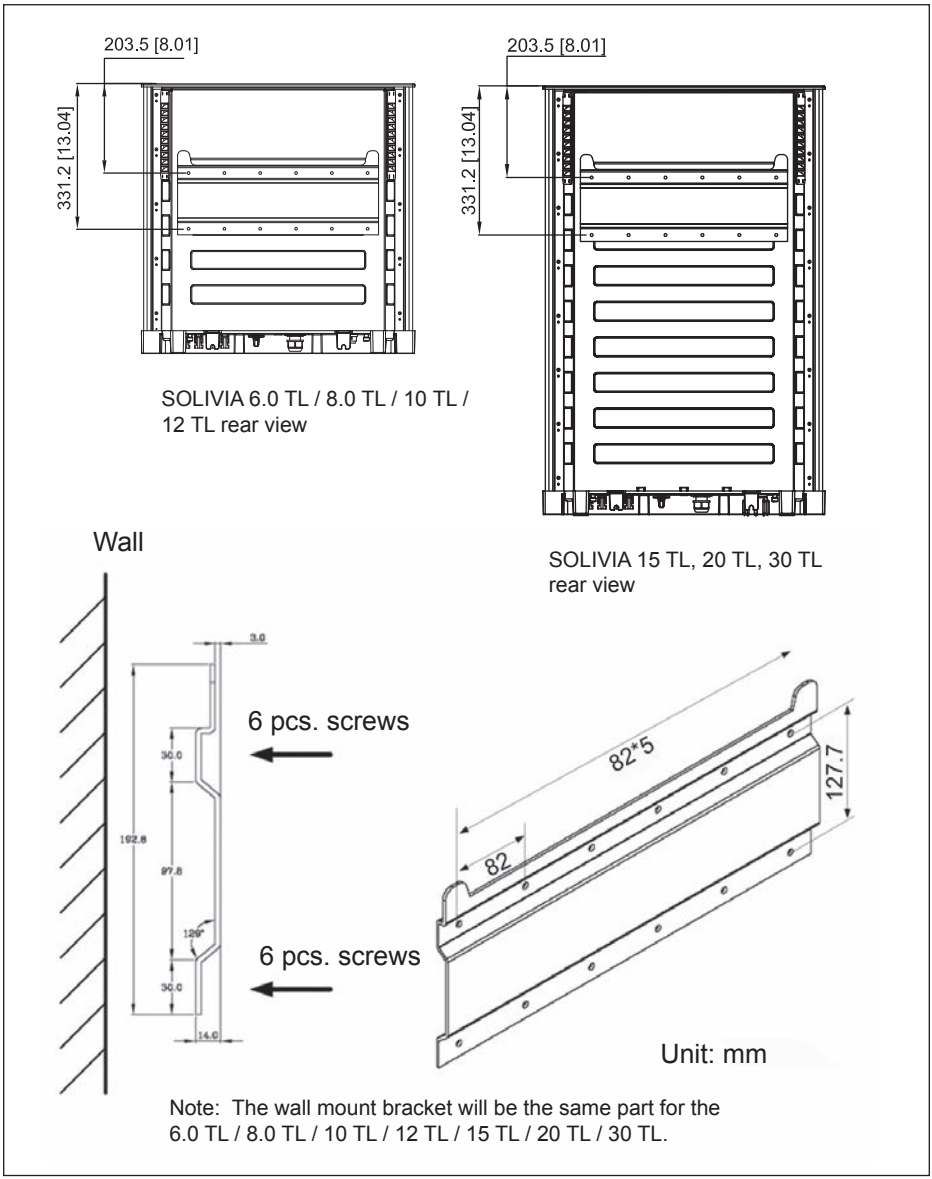


Figure 5.2.: Attaching the mounting bracket to the wall

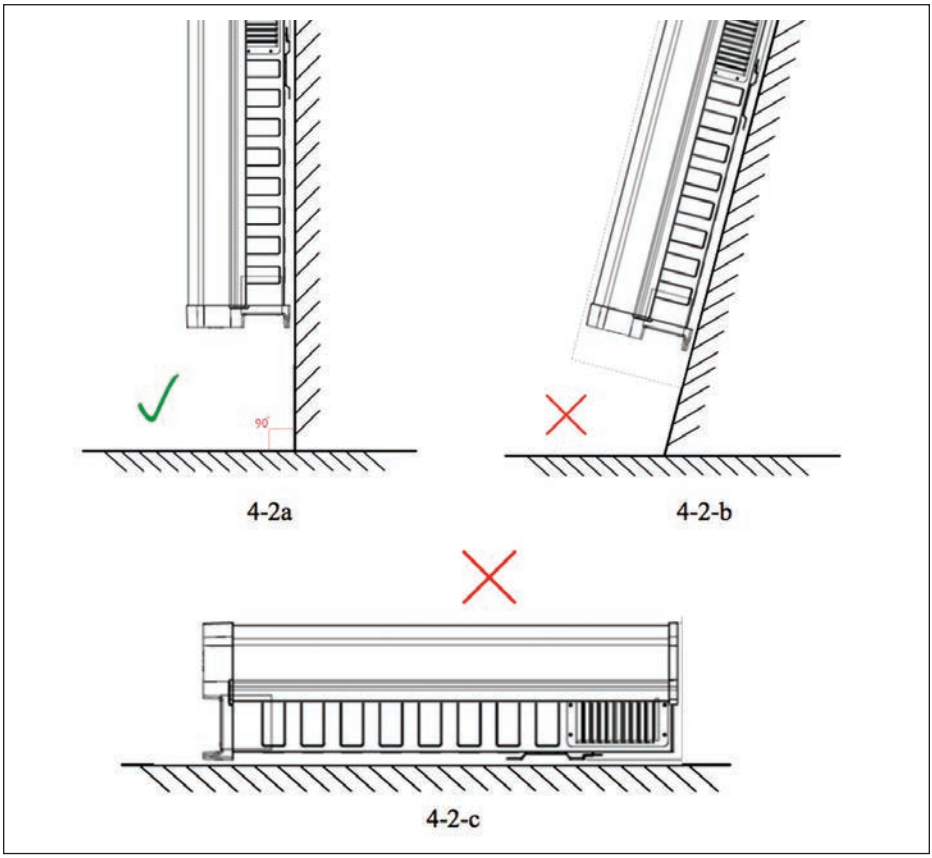


Figure 5.3.: Correct and Incorrect Installation Illustration

CAUTION

Machine and equipment damage may occur.

- ► Please leave an appropriate gap in between when installing single / several DELTA solar inverter systems.
- ► Please install solar inverters at eye level to allow easy observation for operation and parameter setting.
- ► Please install solar inverter in a clean and open space.
- ► The ambient temperature should be between -20°C ... +60°C.

There should be sufficient space for product operation as shown in the figure 5-4. If necessary, the installer should increase the gap space for optimum product performance.

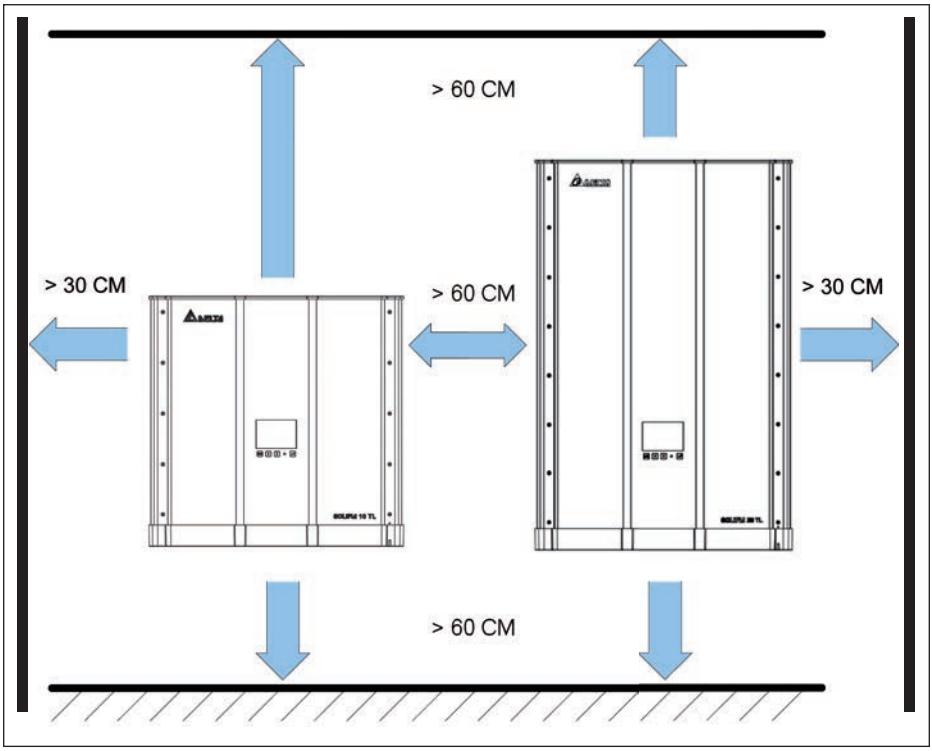


Figure 5.4.: Proper Installation Gap

5.3 Ambient temperature

The solar inverter can be operated in an ambient temperature between -20 °C ... +60 °C. The following diagram illustrates how the power supplied by the solar inverter is reduced automatically in accordance with the ambient temperature. The device should be installed in a well-ventilated, cool and dry location.

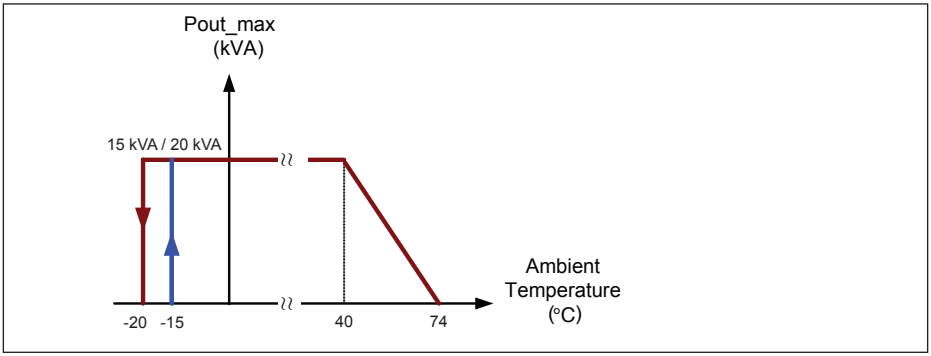


Figure 5.5.: Derating curve for 6.0 TL, 8.0 TL, 10 TL, 12 TL, 15 TL, 20 TL and 30 TL

6. Wiring the Inverter

6.1 Preparation before Wiring

1. To avoid accidents, please confirm that the PV inverter's power of both DC and AC are switched off.
2. Please confirm whether the input/output of PV inverter's wiring are clearly indicated. Make sure that the value, polarity, voltage and phase are correct.
3. The wiring procedure of a PV system is shown in figure 6-1 and 6-2. Wiring details are described in the following paragraphs.
   - When the DC input is floating, an external transformer is not necessary. Please refer to Figure 6-1 for the connection. The inverter can accept DC inputs in parallel (1 MPP tracker) or separate DC input connections (2 MPP Trackers).
   - When an asymmetrical DC load is detected, the solar inverter will automatically adjust for optimum output. Please see section 6.3.1 for more details. This is useful where there are two strings of modules on roof surfaces with different orientations, such as in the case of a dormer with north & south facing surfaces.

CAUTION

Machine and equipment damage may occur.

► When the DC input is a positive ground or negative ground, all of the strings must be connected in parallel and then connected to the inverters. In addition, an external isolation transformer must be installed on the AC side, otherwise, damage will result and the inverter will not work properly. Different DC input wiring needs require different insulation detection settings. To learn more about the settings, please refer to „7.3.6.2 Install Settings“.

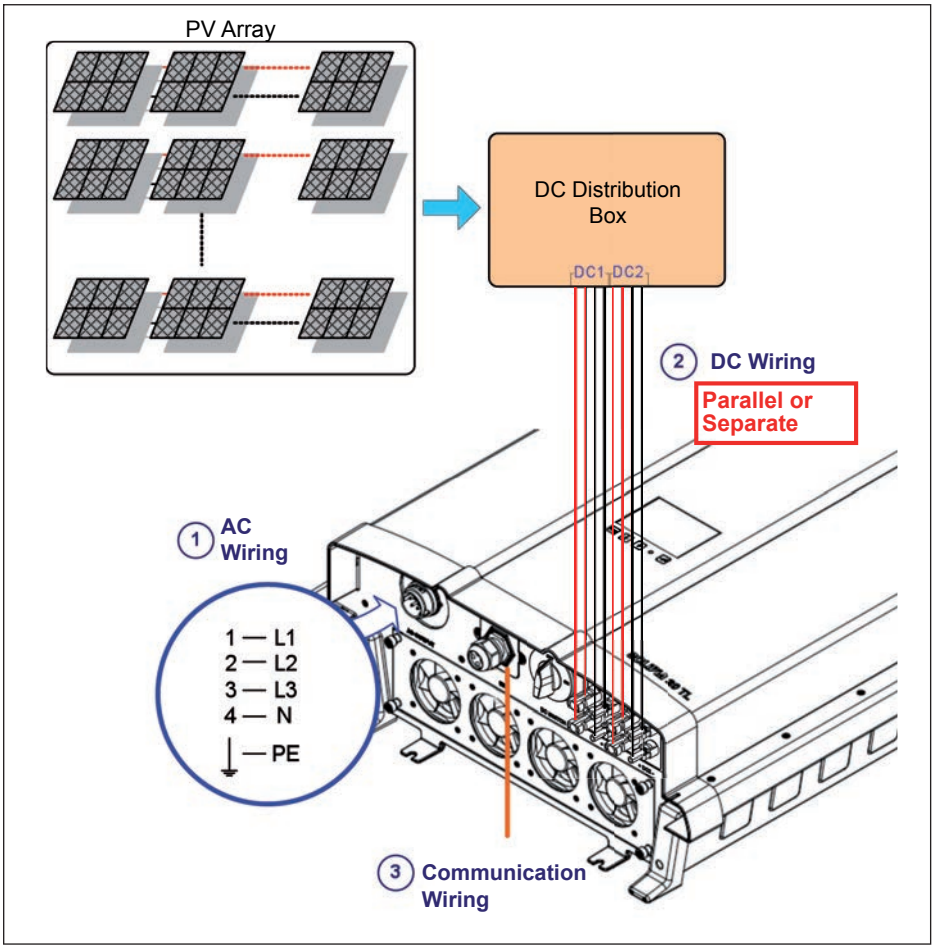


Figure 6.1.: Connection of system if DC inputs are floating

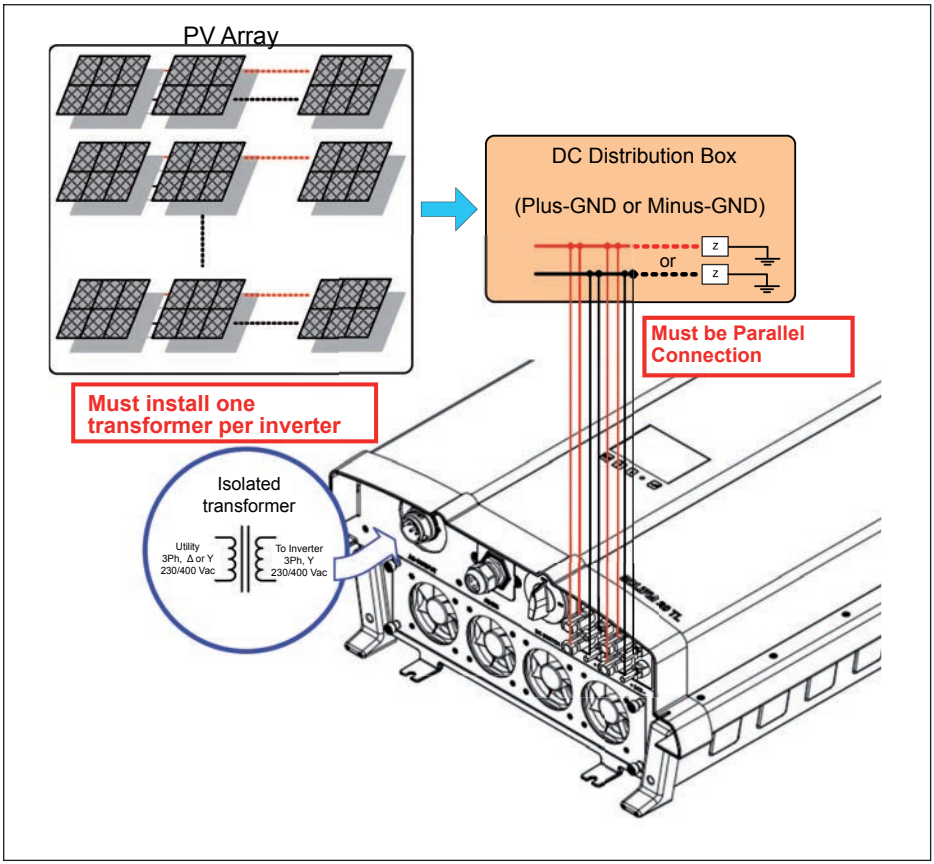


Figure 6.2.: Connection of system with Positive Ground or Negative Ground

6.2 AC Grid Connection: 3 Phase + N + PE

WARNING

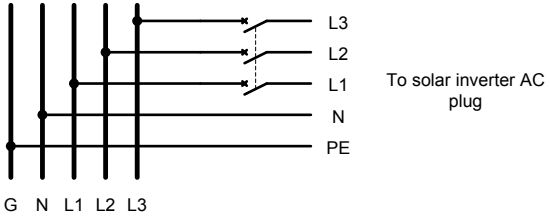
Death and serious injury may occur

► Before engaging in the AC wiring, please ensure the AC 3-phase power is switched off.

6.2.1 Required protective devices and cable cross-sections

Please use the proper upstream circuit breaker to protect the inverter according to the table:

Model	Upstream Circuit Breaker
SOLIVIA 6.0 TL	16 A
SOLIVIA 8.0 TL	16 A
SOLIVIA 10 TL	20 A
SOLIVIA 12 TL	25 A
SOLIVIA 15 TL	32 A
SOLIVIA 20 TL	40 A
SOLIVIA 30 TL	63 A



6.2.1.1 Residual Current Devices

The SOLIVIA TL Soalr Inverters are not capable of feeding in DC residual currents due to their design. They fulfill this requirement in accordance with DIN VDE 0100-712.
The possibilities of faults were examined without taking the integrated residual-current monitoring unit (RCMU) into account. When examining these faults in terms of the current valid installation standards, no danger in combination with a type A upstream residual-current device can occur. Therefore faults that would otherwise require the use of a type B residual-current device due to the inverter can be excluded.
The integrated all-pole sensitive residual-current monitoring unit (RCMU) results in additional safety. For all above mentioned transformerless inverters from Delta RCDs of the type A can be used.

If an external residual current device is required, we recommend using a residual current device, type A; see the table. However, be sure to always adhere to the specific regulations applicable in your country.

		6.0 TL	8.0 TL	10 TL	12 TL	15 TL	20 TL	30 TL
Minimum tripping current of the residual current device	mA	100	100	100	100	300	300	300
Number of inverters [1)]		2	2	1	1	2	2	1

1) Maximale Anzahl Wechselrichter, die mit dem angegebenen FI-Schutzschalter abgesichert werden können.

NOTE

The amount of the tripping current of the residual current device is dependent on the design of the PV installation and the number of connected inverters. The tripping current of the residual current device must not, however, be less than the specified minimum tripping current.

6.2.1.2 AC Cable Requirements

Please use properly sized wire to connect to the correct poles (According to the table below)

Model	AC connector*	Current Rating	Min. / Max. Cable size allowed	Min. / Max. wire size allowed in screw terminals	Torque of terminal screws
6.0 TL ... 20 TL	Amphenol C16-3	≤ 40 A	11 mm / 20 mm	4 mm^2 / 8 mm^2 (12 AWG / 9 AWG)	≥ 0,7 Nm (7 kg-cm)
30 TL	Amphenol PPC AC 24	≤ 60 A	22 mm / 32 mm	10 mm^2 / 16 mm^2 (8 AWG / 6 AWG)	M4 screws ... ≥ 0,9 Nm (10 kg-cm) M6 screws ... ≥ 3 Nm (30 kg-cm)

* Please follow up with Amphenol for the latest information regarding the AC connectors

Table 6.1.: Cable cross sections and torques for AC connectors

AC wiring can be separated into 3-phase (L1, L2, L3), N, and PE. The following earthing configurations are allowed. IT is not allowed. Please see the appendix for further explanation of these earthing systems.

TN-S	TN-C	TN-C-S	TT	IT
Yes	Yes	Yes	Yes	No

Table 6.2.: Permitted earthing systems

NOTE

TT is not recommended. Have to be sure the voltage of N is very close to PE (< 20 V_{rms})

6.2.2 AC bayonet connectors for 6.0 TL, 8.0 TL, 10 TL, 12 TL, 15 TL, 20 TL

The AC bayonet connectors are approved for cable sheath diameters between 11 mm and 20 mm. To install an AC cable, first strip the voltage free line and cable ends as shown below and then follow the sequence in Figure 6.5 to assemble the cable and bayonnet connector.

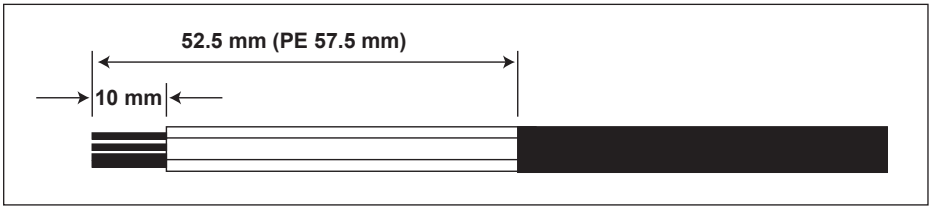
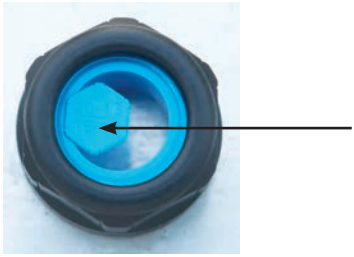


Figure 6.3.: AC cable stripping requirements for 6.0 TL, 8.0 TL,10 TL, 12 TL,15 TL, and 20 TL

NOTE

For lines with a cable sheath diameter from 16 mm to 20 mm, the cable gland must be adapted accordingly. To do this, cut out the inner section of the blue sealing ring.

In Figure 6.5, the Amphenol C connector shown can be mated with the 6.0 TL, 8.0 TL / 10 TL / 12 TL / 15 TL / 20 TL inverter‘s AC plug. After disassembly of the connector, please adhere to the correct polarity for proper AC wiring (this product allows either positive or negative phase sequence). That means the sequence of L1-L3 can be adjusted and the N and PE must be connected.



This is a rear view of the cable gland. For a cable sheath diameter between 16 mm to 20 mm, please remove the inner sealing ring.

Figure 6.4.: AC plug sealing ring for AC connector 6.0 TL, 8.0 TL,10 TL, 12 TL, 15 TL, and 20 TL

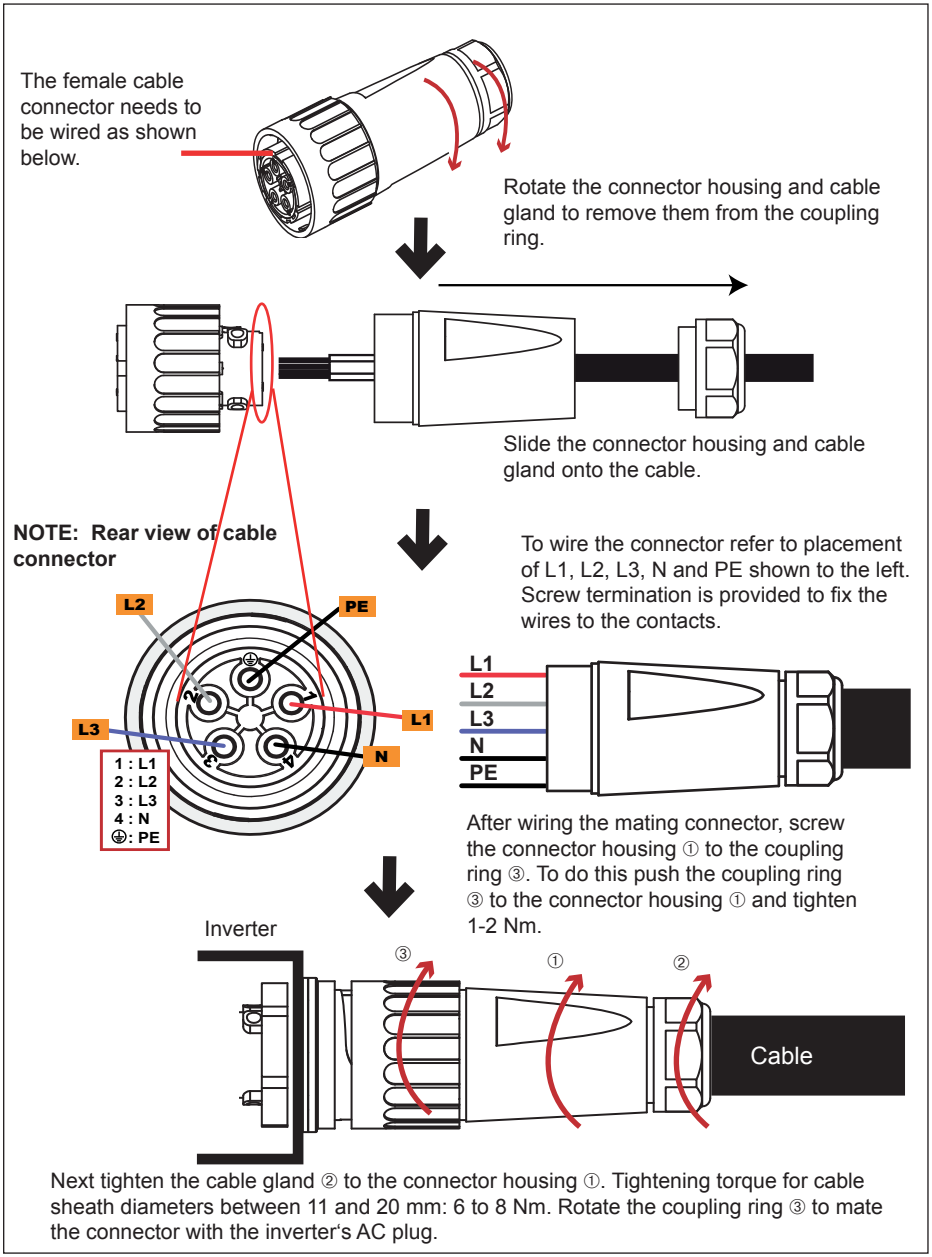


Figure 6.5.: AC connector 6.0 TL, 8.0 TL,10 TL, 12 TL, 15 TL, and 20 TL

CAUTION

Machine and equipment damage may occur.

► Observe the pin assignment of the AC bayonet connector. An incorrect assignment can result in the unit being destroyed. The Figure 6.5 pin out diagram shows the connections inside the AC connector.

NOTE

Make sure the line is provided with a strain relief device. When using cables with a diameter of less than 13 mm (**11 mm ... 13 mm** diameter cable require strain relief), the cable must be relieved just behind the connector.

6.2.3 AC bayonet connectors for 30 TL

The AC bayonet connector for 30 TL are approved for cable sheath diameters between 22 mm and 32 mm. To install an AC cable, first strip the voltage free line and cable ends as shown below and then follow the sequence in Figure 6.7 to assemble the cable and bayonnet connector.

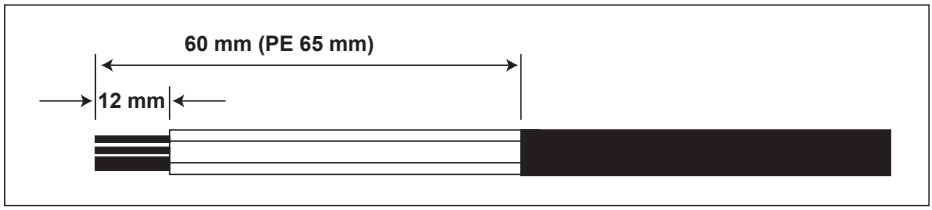


Figure 6.6.: AC cable stripping requirements for 30 TL

In Figure 6.7, the Amphenol PPC AC 24 connector shown can be mated with the 30 TL inverter's AC plug. After disassembly of the connector, please adhere to the correct polarity for proper AC wiring (this product allows either positive or negative phase sequence). That means the sequence of L1-L3 can be adjusted and the N and PE must be connected.

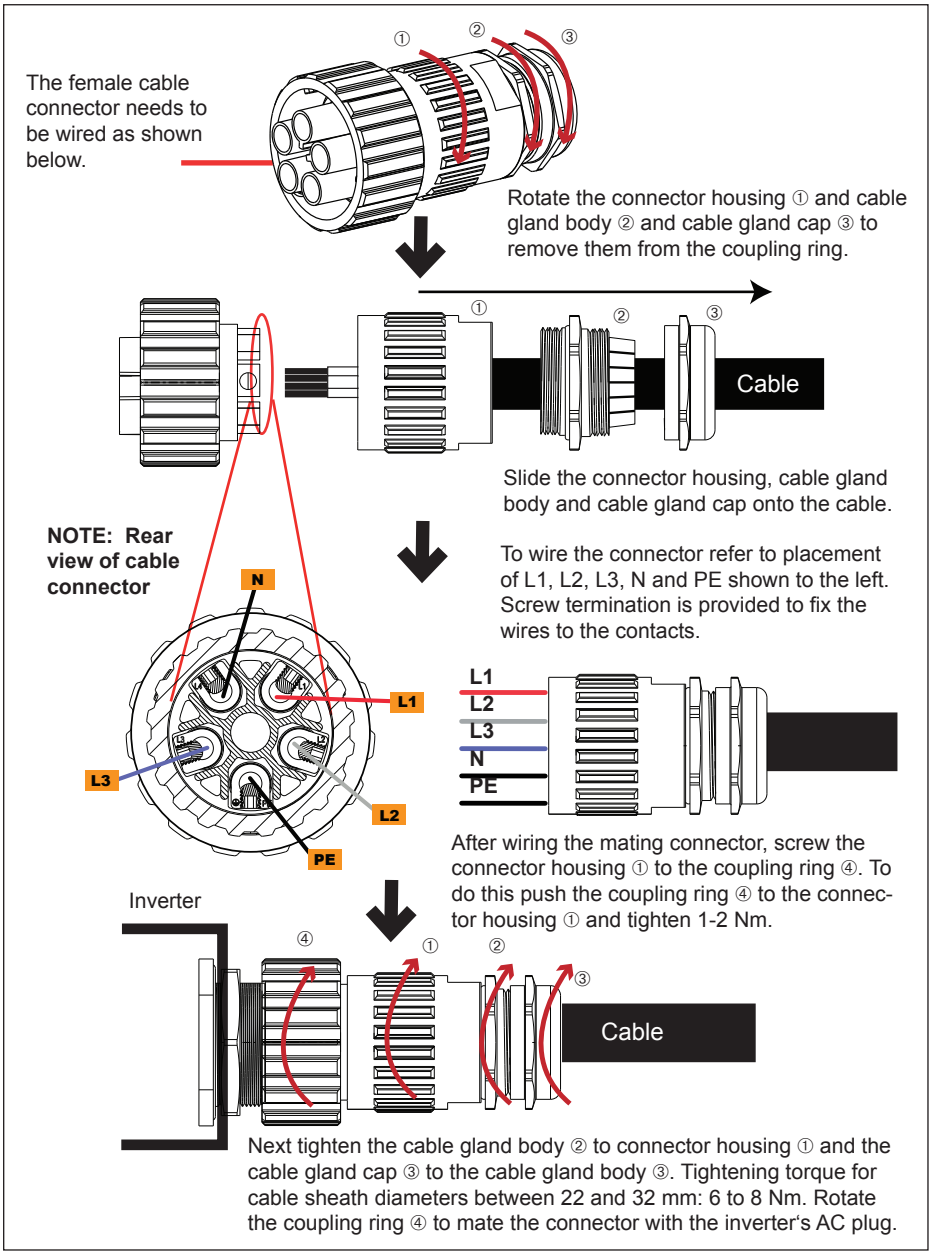


Figure 6.7.: AC connector for 30 TL

6.2.4 AC Wiring Considerations

The connection to the Amphenol AC connector for all models can be made with a flexible or rigid cable with a copper conductor that has the appropriate cross section according to table 6.1 and which has an installation condition that gives a correction factor equal to one. The AC cable should be protected by a minimum type B 40 Amp breaker and minimum type B 60 Amp breaker for 30 TL.

This connector is developed for connection to copper wires (for other applications please contact Amphenol). The cross section of the cable should be calculated by considering the material used, thermal conditions, length of the cable, the type of installation, and AC voltage drop.

Please note the cable length and the cable cross-section, due to the risk of undesirable temperature rise and power losses. In some countries, (e.g. France, Germany, Australia) system installation requirements have to be followed (UTE 15712-1, VDE 0100 712, AS/NZS 5033:2005). This recommendation will define minimum cable sections and protections against overheating due to high currents. Please make sure that you follow specific requirements in your country.

For the security of your installation and for the safety of the user, please install required safety and protection devices that are applicable for your installation environment (example: automatic circuit breaker and/or overcurrent protection equipment).

WARNING

Death and serious injury may occur
In the case of damage or bodily harm resulting from the use of this device in a way contrary to it's intended purpose or as a result of unauthorized modifications made to the parameters of the inverter, Delta will not be held liable in these situations..

The solar inverter must be grounded via the AC connector's PE conductor. To do this, connect the PE conductor to the designated terminal.

The AC connector is protected from unintentional disconnection by a clip mechanism which can be released with a screwdriver.

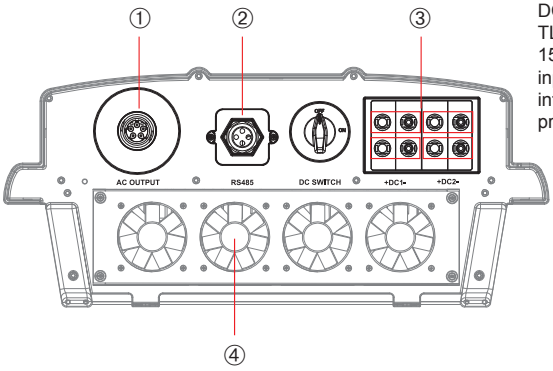
The AC voltage should be as follows:

- L1-N: 230 V_{AC}
- L2-N: 230 V_{AC}
- L3-N: 230 V_{AC}

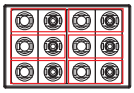
6.3 DC Connection (from PV array)

WARNING

Death and serious injury may occur
- ► When doing DC wiring, please ensure the wiring is connected with the correct polarity.
- ► When doing DC wiring, please confirm that PV array's power switch is off.



DC input panel for the 6.0 TL, 8.0 TL, 10 TL, 12 TL, 15 TL and 20 TL has 4 DC inputs. The 30 TL DC input interface shown below, provides 6 DC inputs.



SOLIVIA 30 EUT4TL

Figure 6.8.: Input/Output Interface

No.	Designation	Description
①	AC connector	400 V_{AC} for 6.0 / 8.0 / 10 / 12 / 15 / 20 TL ; 500 V_{AC} for 30 TL
②	Communication	2 × RS485, 1 × EPO, 2 × Dry contact
③	DC connector	4 Strings (6.0 TL / 8.0 TL / 10 TL / 12 TL / 15 TL / 20 TL), 6 Strings (30 TL)
④	Fans	4 Fans (6.0 TL / 8.0 TL / 10 TL / 12 TL model with only one fan)

NOTE

The fans shown are without the required protective screen for illustrative purposes

CAUTION

Machine and equipment damage may occur.

- ► The connection number of PV ARRAY, open circuit voltage and power of String_1 and String _2 must be coherent.
- ► The connection number of PV ARRAY, open circuit voltage and power of String _3 and String _4 must be coherent.
- ► The maximum open circuit voltage of PV Array must not exceed 1000 V.
- ► The range of V_{mpp} of Input DC1 and Input DC2 shall be 350~800 V_{DC}.
- ► The device installed between PV array and inverter must meet the rating of voltage <1000 V_{DC} and < short current.
- ► The input power connected to the inverter must not exceed the maximum rating of input power as shown in the table below.

Maximum rating of input power:

Type of limit	6.0 TL	8.0 TL	10 TL	12 TL	15 TL	20 TL	30 TL
Total input power	6.6 kW	8.7 kW	11 kW	13 kW	16.5 kW	22 kW	30 kW
Per MPP tracker*	4.4 kW	5,6 kW	7.3 kW	8.7 kW	11 kW	14.7 kW	20.1 kW

*with unbalanced input power

Cable size:

Current rating	Wire size
DC 34 A	5-6 mm^2 / 10 AWG

DC wiring polarity is divided into positive and negative, which is shown in Figure 6-9. The connection should be consistent with the indicated polarity marked on the inverter.

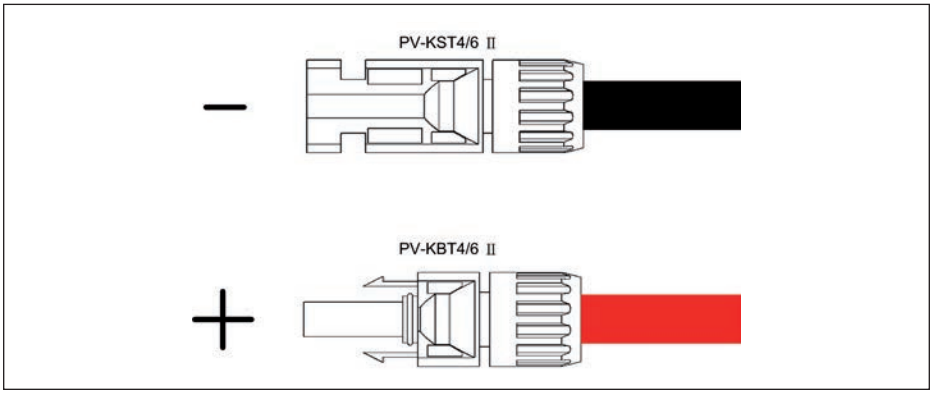


Figure 6.9.: DC Wiring Illustration

6.3.1 Asymmetrical Loading

The inverters operate using two separate MPP trackers that can handle both symmetrical and asymmetrical loads to allow for optimum adjustment. This allows for the requirements of complex PV system designs to be fulfilled. For example: east/west-facing roof (symmetrical load) or a south facing roof such as a dormer (asymmetrical load).

See the following figures for explanation of how symmetrical and asymmetrical loading are handled:

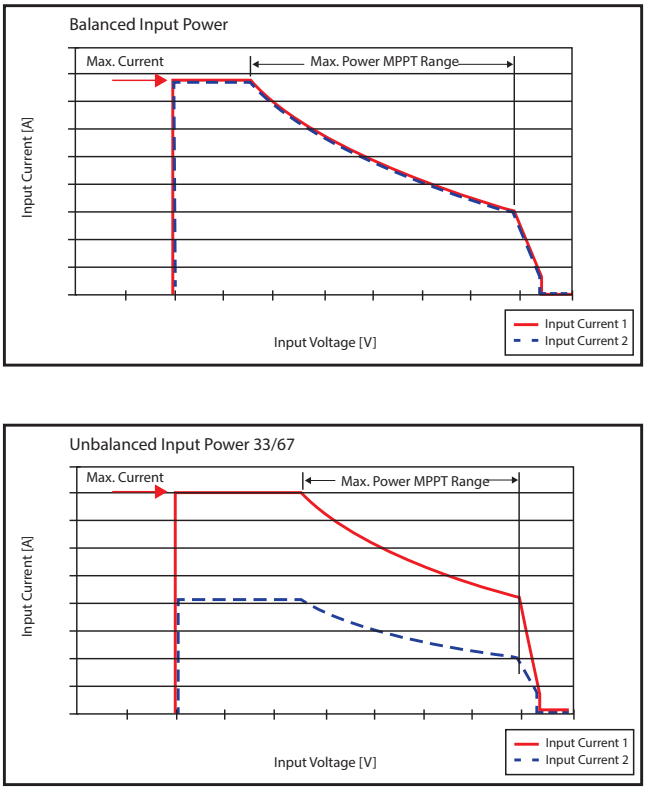


Figure 6.10.: Comparison diagram of Balanced Power Input and Unbalanced Power Input

Maximum rating of input power:

Model	Max. Input Current	Max. Power MPPT Range balanced (50/50)	Max. Power MPPT Range unbalanced (33/67)
SOLIVIA 6.0 TL	10 A x 2	315 ... 850 V_{DC}	250 ... 850 V_{DC} (33/67%) 420 ... 850 V_{DC} (67/33%)
SOLIVIA 8.0 TL	17 A x 2	280 ... 850 V_{DC}	280 ... 850 V_{DC} (33/67%) 330 ... 850 V_{DC} (67/33%)
SOLIVIA 10 TL	20 A x 2	350 ... 850 V_{DC}	350 ... 850 V_{DC}
SOLIVIA 12 TL	20 A x 2	420 ... 850 V_{DC}	420 ... 850 V_{DC}
SOLIVIA 15 TL	24 A x 2	350 ... 800 V_{DC}	470 ... 800 V_{DC}
SOLIVIA 20 TL	30 A x 2	350 ... 800 V_{DC}	480 ... 800 V_{DC}
SOLIVIA 30 TL	34 A x 2	480 ... 800 V_{DC}	620 ... 800 V_{DC}

A kit to meet UTE 15712-1 requirements is provided for the SOLIVIA 15 TL and 20 TL and can be ordered from Delta with the part number in the following table.

	Designation	Part number Delta
	UTE kit Multi-Contact* *Kit contains caps for 4 strings. For 30 TL, 2 additional caps will be needed since 6 strings are available..	EOE90000341

6.4 Efficiency

The best efficiency of the solar inverter is obtained at an input voltage of 640 V.

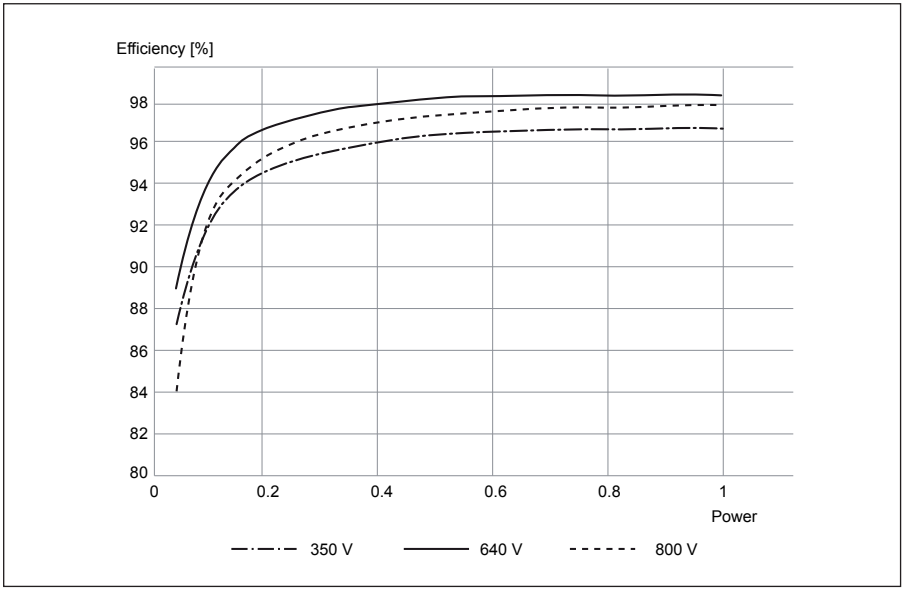


Figure 6.11.: SOLIVIA 6.0 TL Efficiency Curve

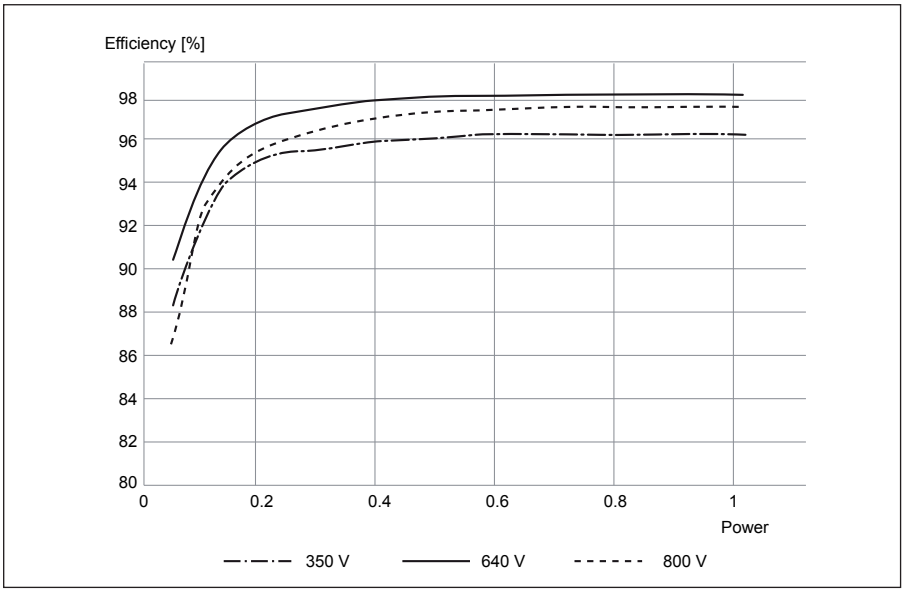


Figure 6.12.: SOLIVIA 8.0 TL Efficiency Curve

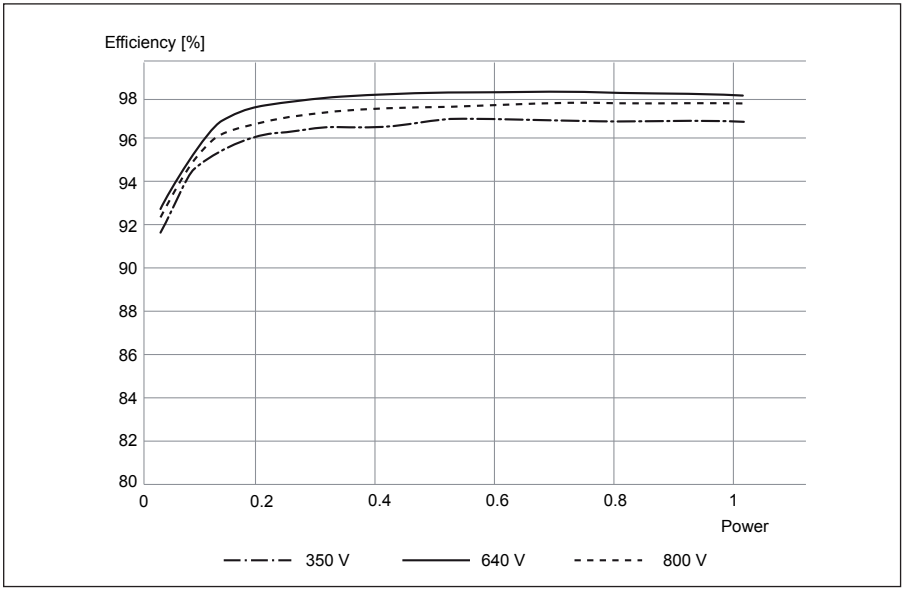


Figure 6.13.: SOLIVIA 10 TL Efficiency Curve

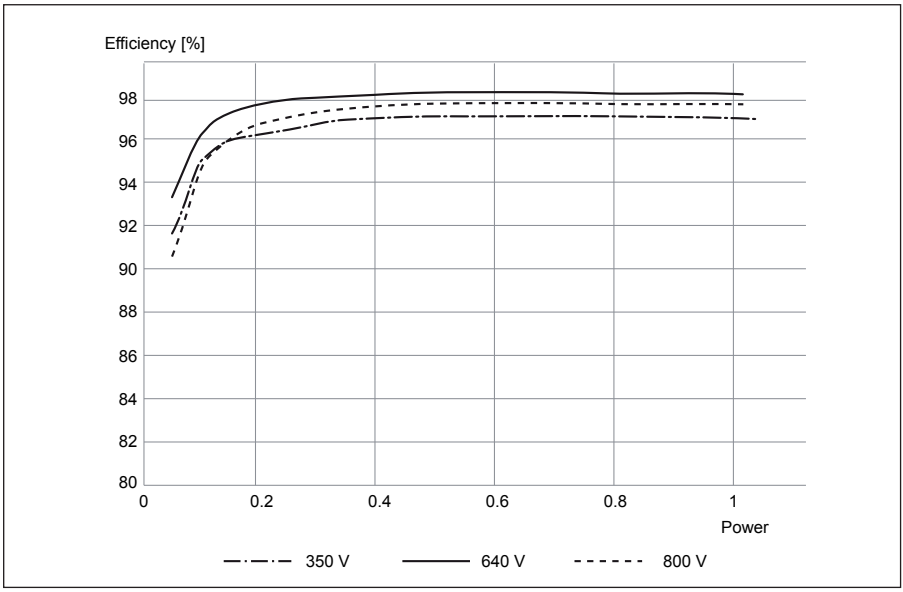


Figure 6.14.: SOLIVIA 12 TL Efficiency Curve

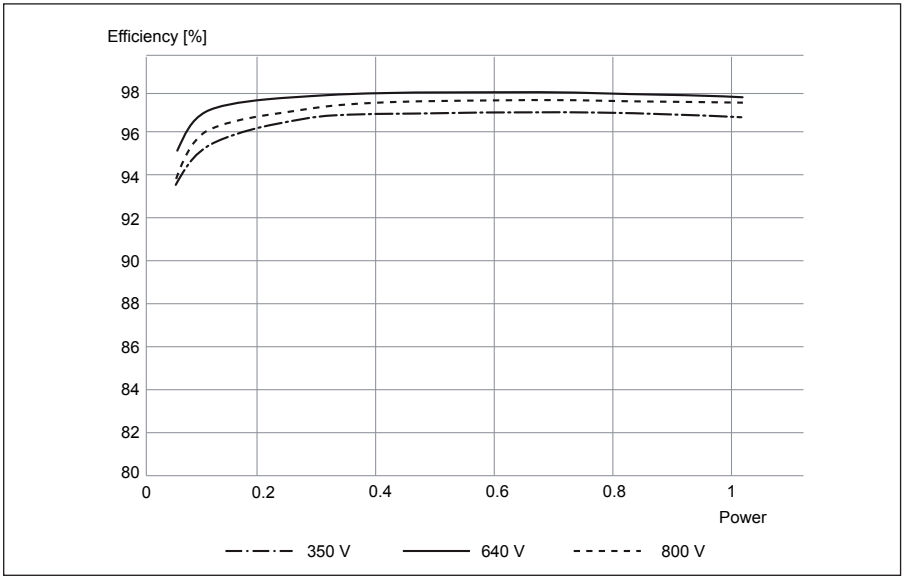


Figure 6.15.: SOLIVIA 15 TL Efficiency Curve

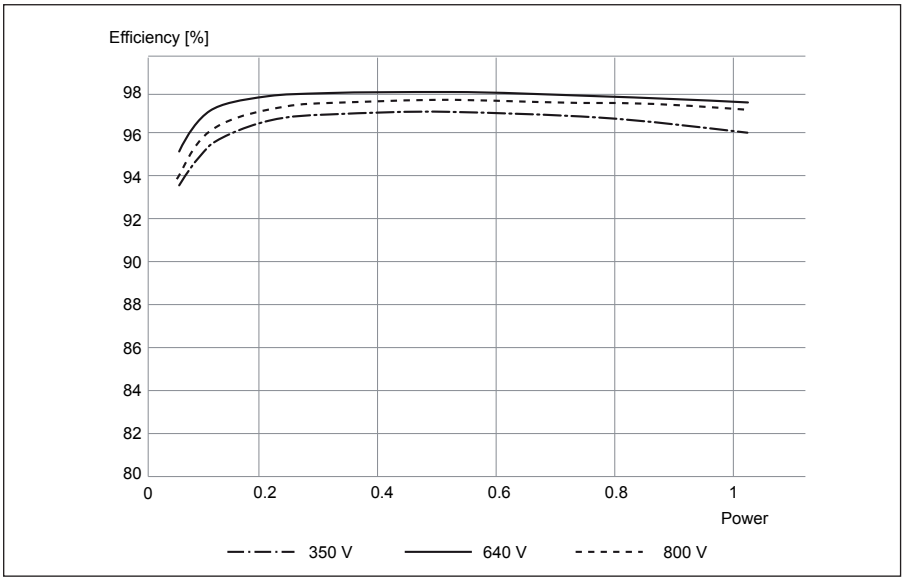


Figure 6.16.: SOLIVIA 20 TL Efficiency Curve

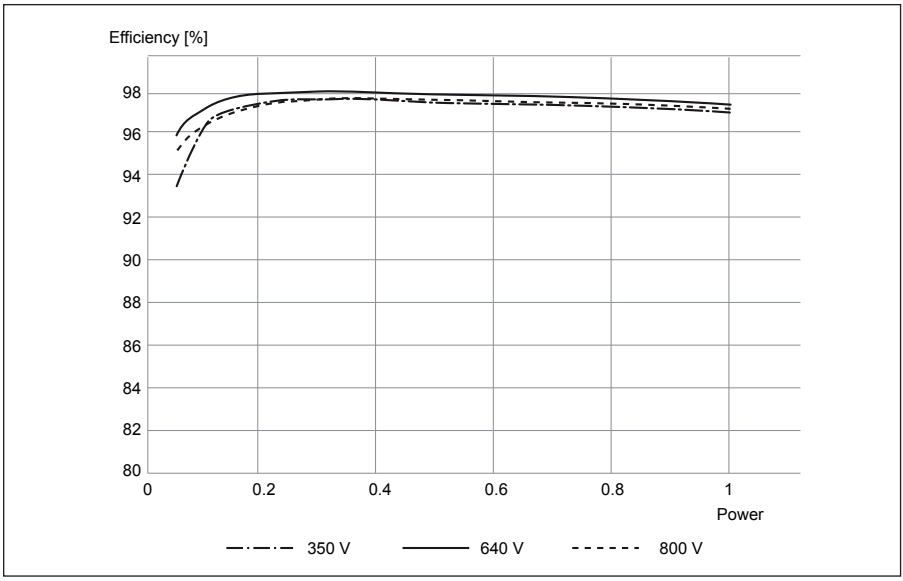


Figure 6.17.: SOLIVIA 30 TL Efficiency Curve

6.5 Communication Module Connections

The communication module supports the communication functions with a computer, also provides 1 EPO (Emergency Power Off) and 2 sets of dry contacts. The parts of the communication module are shown in Figure 6.15. The function of each part is detailed in sections 6.5.1 ... 6.5.3.

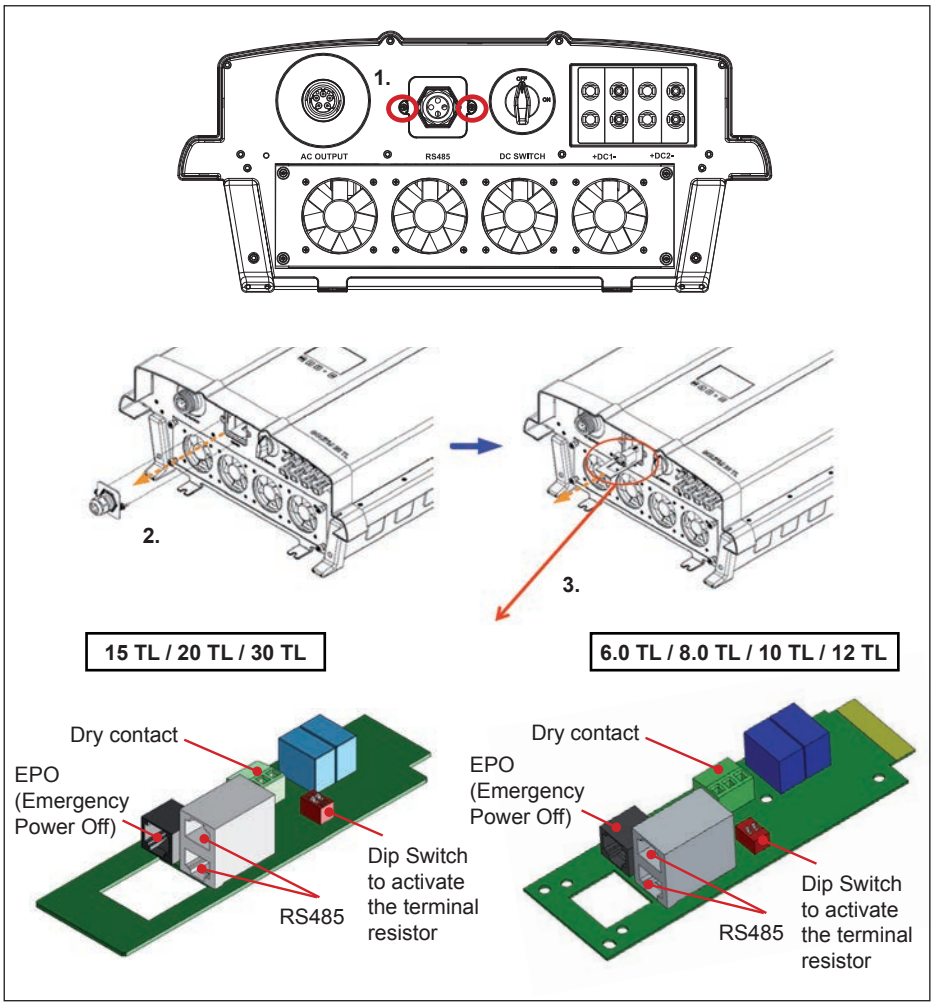


Figure 6.18.: Communication module removal

To remove the communication module follow these instructions:

1. Unscrew and remove the two Phillips screws highlighted above in Figure 6.15.
2. Remove the front plate as shown.
3. Carefully pull out the communication module from the inverter. Remove glands and plugs where applicable.

6.5.1 RS485 Connection

The pin definition of RS485 is shown in Table 6.3. The wiring of multi-inverter connections is shown in Figure 6.16.

PIN	FUNCTION
4	GND
7	DATA+
8	DATA-

Table 6.3.: Definition of RS485 pin

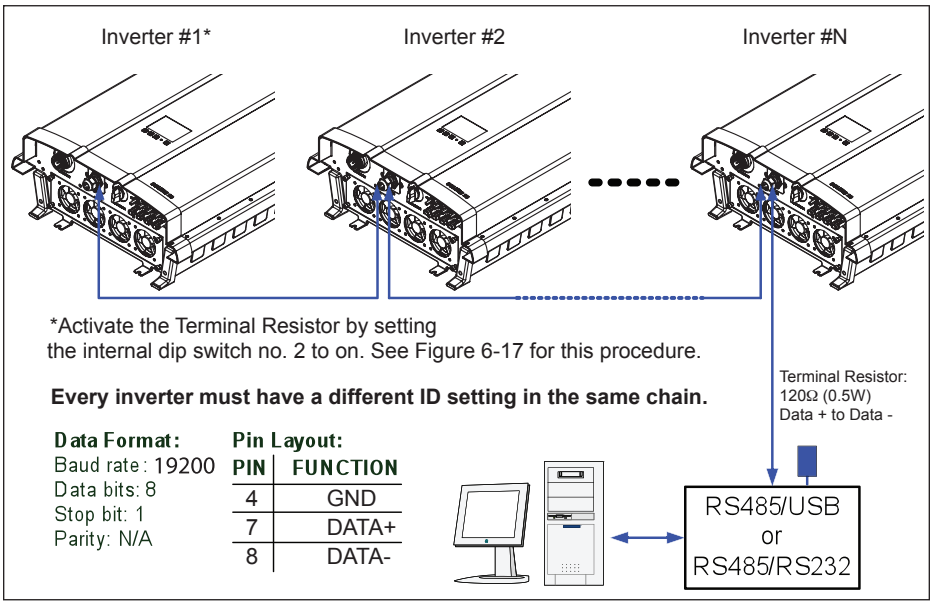


Figure 6.19.: Multi-inverter connection illustration

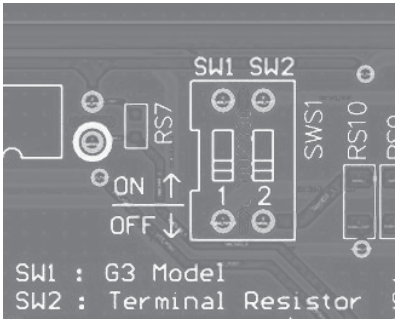


Figure 6.20.: Terminal resistor switch for Multi-inverter Connection

To engage the internal Terminal Resistor, place switch number 2 on the communication module in the on position. See figure 6.17 for more information.

Baud Rate	Programmable, 2400/4800/9600/19200/38400, default = 19200
Data Bit	8
Stop Bit	1
Parity	N/A

Table 6.4.: RS485 Data Format

6.5.2 EPO (Emergency Power Off) Connections

The SOLIVIA TL inverters provide two sets of emergency power off functions. When the outer external switch is shorted, the inverter will shut down immediately. Please see Table 6.5 for the pin definition.

PIN	Definition
1	EPO1
2	EPO1
3	N/A
4	EPO2
5	EPO2
6	N/A
7	N/A
8	N/A

Table 6.5.: EPO pin assignment

NOTE

To shutdown the inverter, short pin 1 and 2 or short pin 4 and 5.

6.5.3 Dry Contact Connection

Provides 2 sets of Dry Contact functions - NO1 and NO2. Please refer to Figure 6.16 for connection diagram and read below for more details.

NO1: When a fault is detected, COM and NO1 will be shorted.

NO2: When the inverter is on grid, the COM and NO2 will be shorted.

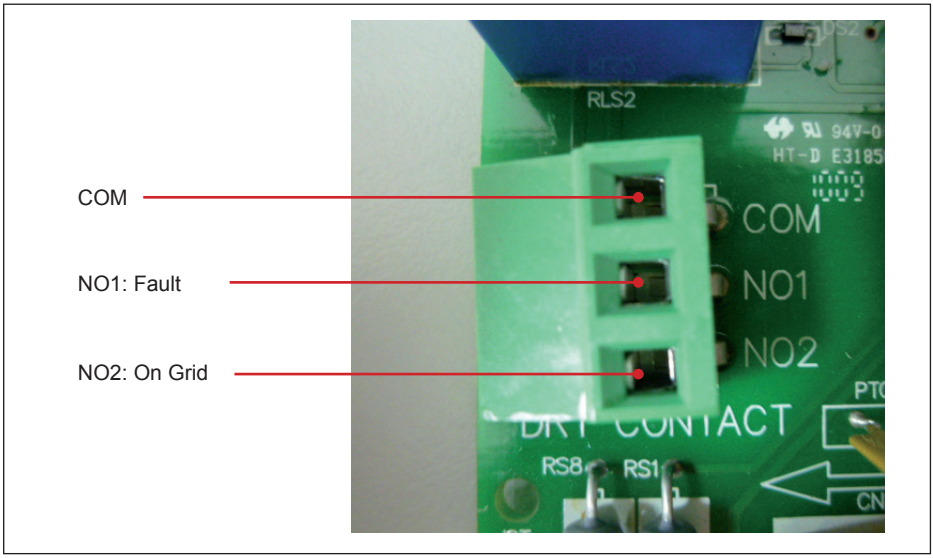


Figure 6.21.: Dry contact connection

7. Operating the PV inverter

WARNING

Burn hazard!
The enclosure temperature may exceed 70° C while in operation. Injury may occur owing to the hot surface.
► Please do not touch!

After installation, please confirm the AC, DC, and Communication connections are correct. Follow the steps below to startup the inverter:

1. Check the PV array DC voltage:
   - Uncover the PV arrays and expose them to full sunlight.
   - Measure the PV array open circuit DC voltage across the DC positive (+) and negative (-) terminals in the DC distribution box. This voltage must be greater than 250 V_{DC} and less than 1000 V_{DC}.
2. Check the AC utility voltage:
   - Using an AC voltmeter to measure the AC utility voltage and ensure the voltage is at approximately the nominal value (Nominal = 230 Vac Line-N).
3. Set all necessary settings:
   - Switch on AC breaker to provide power to the inverter (40 seconds)
   - Check the inverter display.
   - Country & Language settings appear on the display at first startup.

NOTE

The country list may change due to ongoing certification processes. If you have any questions, please contact the Delta Support Team.

Countries supported*: Belgium, France, Italy, Netherlands, Spain, Greece, Germany, Czech Republic, Slovakia, Slovenia, Portugal, Bulgaria, Romania, United Kingdom, United Kingdom (240 V), Australia, French Islands, Denmark.

Language supported: English, Italian, French, German, Dutch, & Spanish

*Please check on the Delta website for updated list of countries approved.

The next step is to set up the inverter for the appropriate grid on the first startup. The grid selection for each inverter model can be found on the following list:

Grid (As shown on the Display)	Description	6 TL	8 TL	10 TL	12 TL	15 TL	20 TL	30 TL
Australia	Australia AS 4777					x	x	
Belgium	Belgium as per C10/11, June 2012			x		x	x	x
Bulgaria	Bulgaria as per VDE 0126					x	x	
Czech	Czech Republic as per VDE 0126-1-1			x		x	x	x
Denmark	Denmark as per VDE AR N 4105	x		x		x	x	x
France	France as per UTE 15 712-1			x		x	x	x
France (60Hz)	French Islands 60 Hz					x	x	
France VFR 2013	France - VDE 0126-1-1 / A1 with 50.4 Hz.	x		x		x	x	x
France VFR 2014	France - VDE 0126-1-1 / A1 with 50.6 Hz.	x		x		x	x	x
Germany (VDE0126)	Germany as per VDE 0126-1-1			x		x	x	x
Germany (LVD)	Germany as per VDE AR N 4105	x	x	x	x	x	x	x
Germany (MVD)	Germany as per BDEW					x	x	x
Greece	Greece as per VDE 0126			x		x	x	
Italy BT CEI 0-21	Italy as per CEI 0-21:2012-06			x		x	x	x
Netherlands	Netherlands as per VDE 0126-1-1 + EN 50438			x		x	x	x
Poland	Poland as per EN 50438			x				x
Portugal	Portugal as per EN 50438					x	x	x
Romania	Romania as per VDE 0126-1-1			x		x	x	x
Slovakia	Slovakia as per VDE 0126-1-1			x		x	x	x
Slovenia	Slovenia as per SONDO Class C					x	x	x
Spain (RD661)	Spain as per RD 661					x	x	
Spain (RD1663)	Spain as per RD 1663					x	x	
Spain (RD1699)	Spain as per RD 1699					x	x	
UK	United Kingdom G59-2 230 V					x	x	x
UK (240)	United Kingdom G59-2 240 V					x	x	x

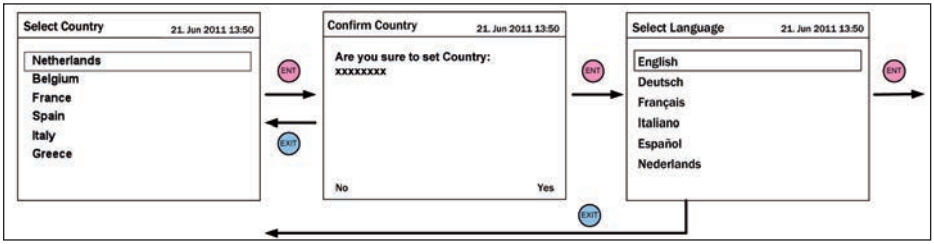


Figure 7.1.: Country Settings on initial startup

– Set all settings for Date, Time, Inverter ID, Insulation, etc.

NOTE

- If selecting **Germany or Italy** as the country, it could be necessary to adjust active and reactive power settings (Information for the settings will come from the local grid operator).
- If needed please call the local support hotline for assistance in setting up Germany MVD/LVD or Italy CEI 0-21 / A70 grid settings.

4. Start up the inverter:
   - After finishing the basic settings, turn on DC switches (including the DC switch in inverter), inverter will do some self-tests and start a countdown if there is no problem.
   - When operating, check all information on the display is correct (ex. Input voltage, current and power; output voltage, current, power and frequency)

When solar irradiation is sufficient, the device will operate automatically, after the self-auto test is completed successfully (about 2 minutes on the first startup of a day). Please refer to Figure 7.2 showing the LCD Display and Control Panel details. The display includes a 5“ graphic LCD with 320x240 dots of resolution and a LED indicator showing inverter status. There are green and red colored LED indicator lights to represent various inverter states of operation. Please refer to Table 7-1 for more detail on the LED indicator.

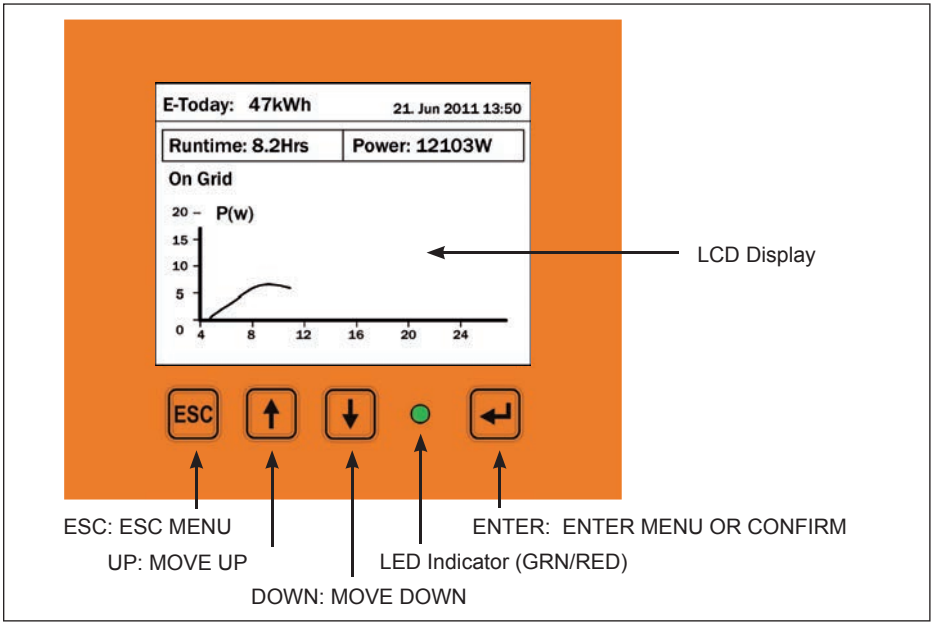


Figure 7.2.: LCD Display and Control Panel

Inverter Status	Green LED	Red LED
Standby or Countdown	FLASHING - on 1 sec. and off 1 sec.	OFF
Power ON	ON	OFF
Error or Fault	OFF	ON
Night time (No DC)	OFF	OFF
Bootloader mode	FLASHING - on 1 sec. and off 1 sec., first the green LED then the red LED in alternating sequence	

Table 7.1.: LED indicator

7.1 Disconnection Parameter Settings

7.1.1 Power Disconnection Device (PDD) Settings

This applies to LVD and MVD settings when selecting the grid as DE LVD or DE MVD.

NOTE

DE LVD refers to Germany Low Voltage Directive and DE MVD refers to Germany Midvoltage Directive.

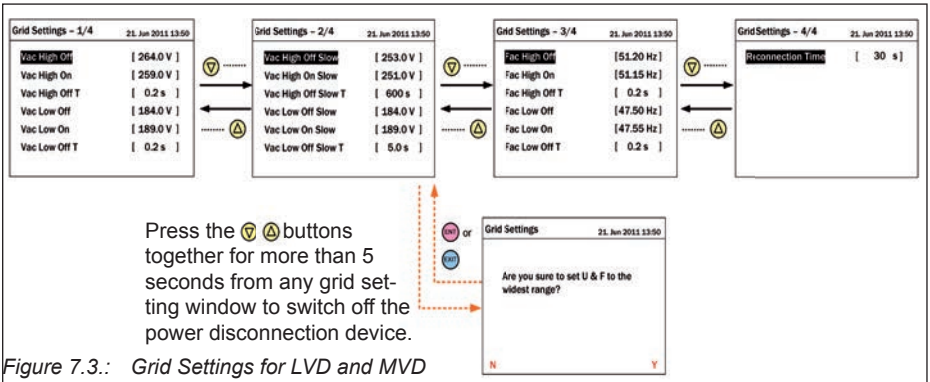


Figure 7.3.: Grid Settings for LVD and MVD

The grid settings for Germany LVD and MVD can be tuned according to the local utility requirements. The integrated power disconnection device can be set in three modes: 1) set to default values as recommended by LVD/MVD regulations, or 2) adjustments can be done manually within the allowed parameter ranges according to the LVD/MVD regulations depending on the selected mode, or 3) the device can be switched off.

At any time, while you are viewing one of the 4 grid setting windows, you are able to switch off the power disconnection device by simultaneously pressing the up and down buttons and holding for more than 5 seconds.

See the tables below for the LVD/MVD allowed parameter ranges according to the regulations:

When the selected grid is LVD, the following adjustable vaules are allowed:

Parameter	Name in display	Adjustable values
Rise-in-voltage protection U>	Umax	110 ... 115%

As defined in VDE AR N 4105, only the rise-in-voltage protection Umax shall be designed as 10-minute running mean value protection which prevents the upper voltage limit specified in DIN EN 50160 from being exceeded (monitoring over the power).

When the selected grid is MVD (BDEW), the following adjustable values are allowed:

Parameter	Name in display	Adjustable values	Recommended settings of protection relays as per BDEW	
Rise-in-voltage protection U>>	Crit. Umax	1.00 ... 1.30 U_n	1.20 U_{ns}	≤ 100 ms
Under-voltage protection U<	Umin	0.10 ... 1.00 U_n	0.80 U_{ns}	1.5 - 2.4 s
Under-voltage protection U<<	Crit. Umin	0.10 ... 1.00 U_n	0.45 U_{ns}	300 ms
Rise-in-frequency protection f>	Fmax	50.0 ... 52.0 Hz	51.5 Hz	≤ 100 ms
Under-frequency protection f<	Fmin	47.5 ... 50 Hz	47.5 Hz	≤ 100 ms
Delay time for U<	tUmin	1.5 ... 2.4 s	1.5 ... 2.4 s	

Table 7.1.: Recommended settings of protection equipment as per BDEW Technical Guidelines - June 2008 issue from Table 3.2.3.3 - 2

7.1.2 SPI device

The SPI is a system interface protection device for use in Italy. There is no internal SPI required for this inverter but an external SPI device may be requested. Care must be taken so disconnection settings on the inverter are set so they do not interfer with external SPI device disconnection settings. The password “5555” entered in the Install Settings page when Italy is selected as the Country, enables disconnection parameters to be adjusted directly within the grid settings menu.

7.2 Home Page

When the inverter is operating normally, the LCD will show the home page as shown in Figure 7.4. On the home page the user can find the output power, inverter status, E-today, date and time.

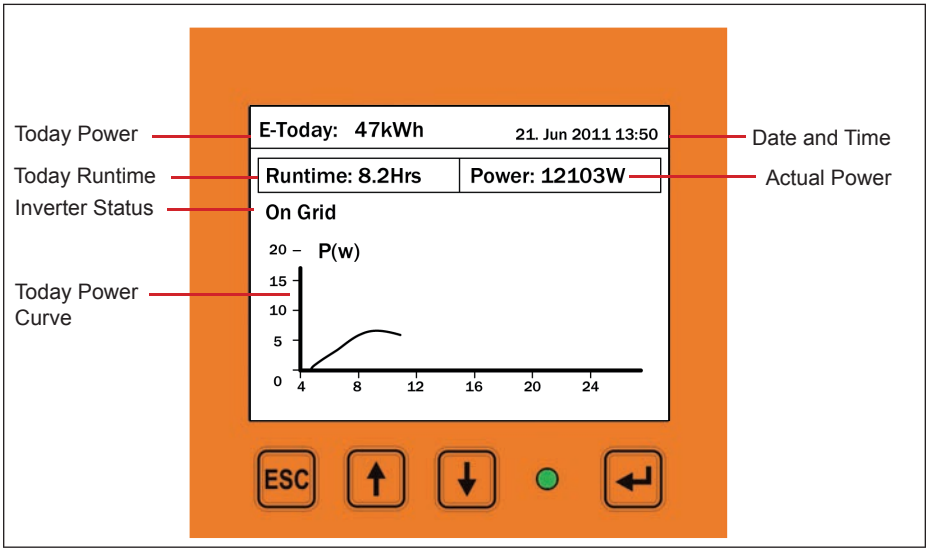


Figure 7.4.: Home page

7.3 LCD Flow Chart

Press any button to enter the menu page, the selections are shown in Figure 7.5. E-today is on the home page; the content of the rest of the pages will be explained in detail from 7.3.1 ... 7.3.6.

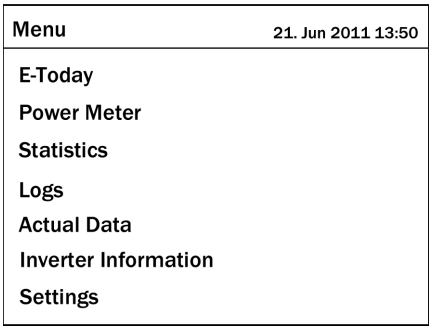


Figure 7.5.: Main menu page

"„7.3.1 Power Meter“ on page 58

"„7.3.2 Statistics“ on page 58

"„7.3.3 Logs“ on page 59

"„7.3.4 Actual data“ on page 60

"„7.3.5 Inverter Information“ on page 61

"„7.3.6 Settings“ on page 61

7.3.1 Power Meter

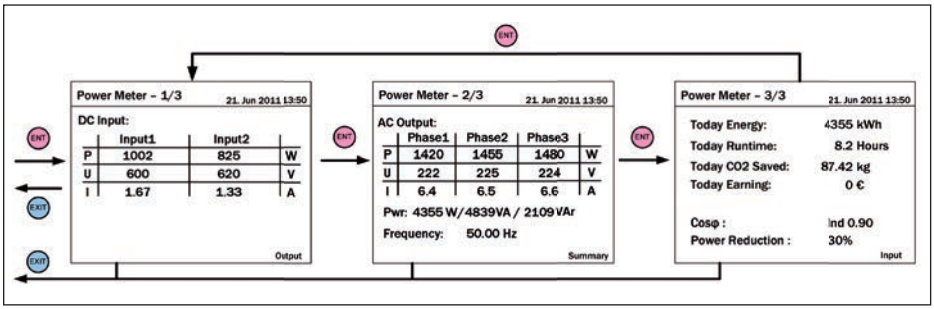


Figure 7.6.: Power Meter Pages

7.3.2 Statistics

After pressing **ENT** on this page, the user can view the historical data about power generation on a yearly, monthly and daily basis.

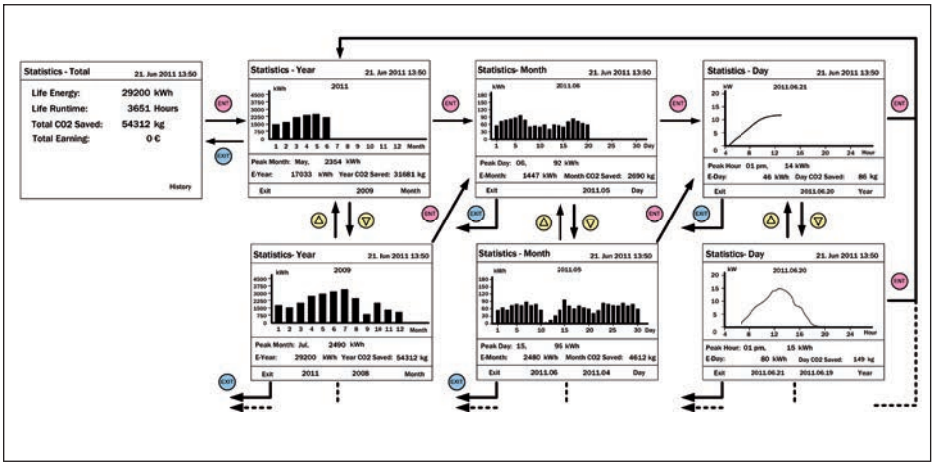


Figure 7.7.: Statistics Pages

7.3.3 Logs

After pressing **ENT** on this page, the user can view the internal log and can view the events log.

7.3.3.1 Internal Data

The internal data shows all messages coming from the inverter. These messages indicate the status of internal processes and also changes on the AC and DC terminals, for example: frequency, voltage, etc.

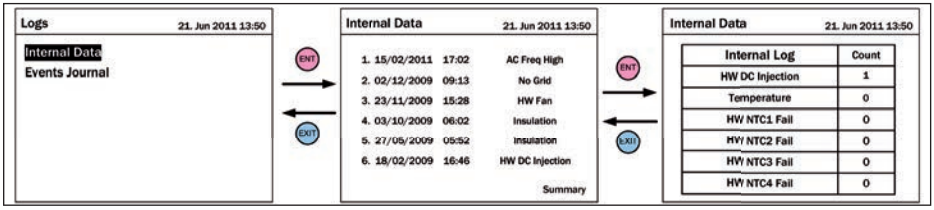


Figure 7.8.: Internal Data Flow Chart

7.3.3.2 Events Journal (Germany LVD or MVD Grid Only)

The events journal records all events coming through the RS485 link or made on the display at the user level. Only events that could affect global production are shown in this log.

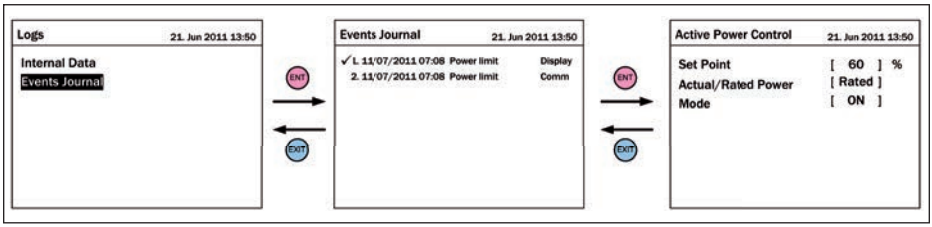


Figure 7.9.: Events Journal Flow Chart

7.3.4 Actual data

Actual data includes 4 pages and records the maximum and/or minimum historical values, including voltage, current, power and temperature.

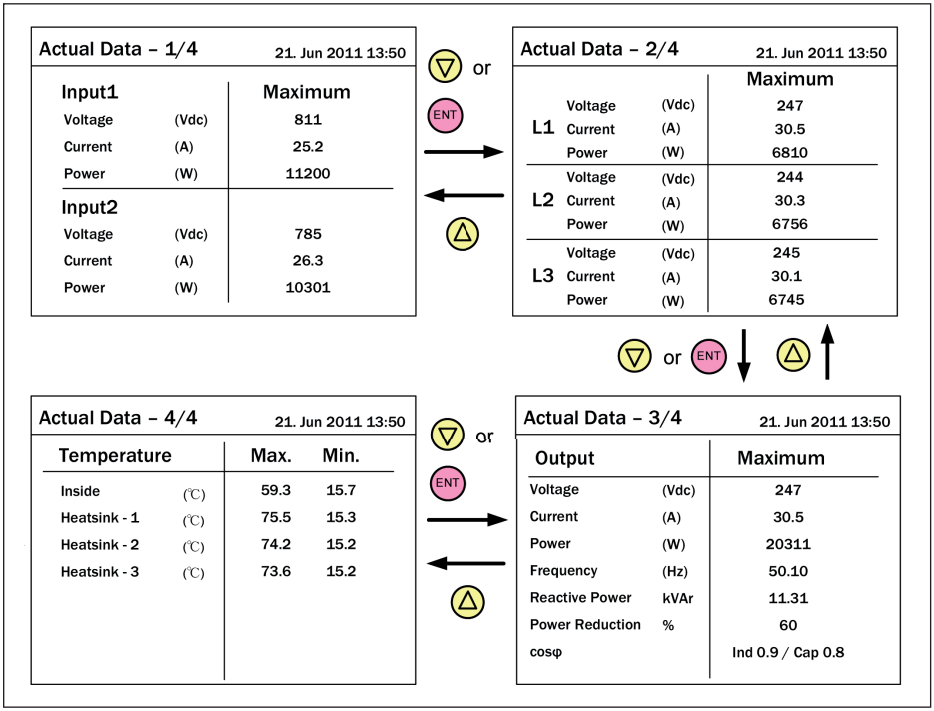


Figure 7.10.: Actual Data Flow Chart

7.3.5 Inverter Information

This page includes the following information: serial number, firmware version, installation date, and inverter ID. To change the inverter ID, please refer to "„7.3.6.2 Install Settings" on page 62.

Figure 7.11.: Inverter Information Page

NOTE

The information shown in Figure 7.11 is for illustration purposes and may not match the actual information displayed on your inverter.

*The last menu items are only applicable for installations in Italy. If CEI 0-21 or A70 is selected as the country, then the Country name will show on the 2nd page. For Italy, the software version will show.

7.3.6 Settings

Settings includes General Settings, Install Settings, and Active/Reactive Power Control.

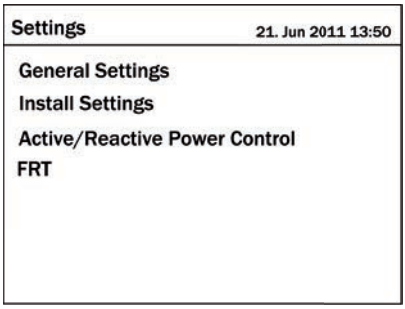


Figure 7.12.: Settings Page

NOTE

FRT is only accessible if you have selected Germany MVD, Italy CEI 021 or A70 as your grid selection.

7.3.6.1 General Settings

Settings in the General Settings include Language, Date, Time, Screen Saver, Brightness, Contrast, Baud Rate, CO2 saved, Earning Value, and Currency.

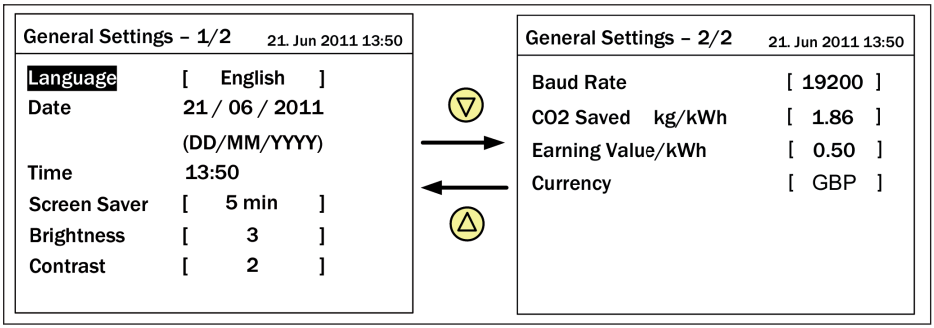


Figure 7.13.: General Settings Page

User can set the Language, Date, Time, Screen Saver, LCD Brightness, and Contrast appear on the General Settings page 1. Screen Saver can be adjusted from 5 minutes to 60 minutes. When over the setting time limitation, without the pressing of any buttons, the LCD backlight will go off automatically. Brightness and contrast can be adjusted from 1-5 levels (low to high). On General Settings page 2 the Baud Rate, CO2 Saved, Earning Value and Currency are adjustable. Currency is selectable as Australian Dollar (AUD), Euro (EUR) and Great Britian Pound (GBP).

7.3.6.2 Install Settings

Correct passwords are requested when entering Install Settings. Install Settings for user and installation technicians are different. The password can not be revised. After confirmation of the installer password (5555), user can set Inverter ID and Insulation settings. Country is viewable but not adjustable.

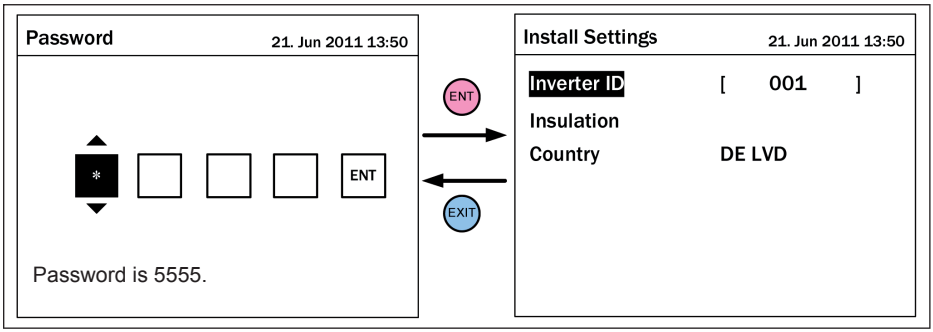


Figure 7.14.: Install Settings Page - Installer Mode

- **Inverter ID:** This setting is used to set unique ID's for installations with more than one inverter. In a multi-inverter installation where the inverters will be in a network, each inverter must have a unique ID.
- **Insulation:** ON means enable the measurement of impedance between Array and PE, will not connect to Grid if failure. Depending on DC wiring conditions, user can set 6 kinds of insulation detecting methods - ON, Positive Ground, Negative Ground, DC1 only, DC2 Only, or Disable. Installer can select different resistance criteria according the actual conditions.
- **Country:** This is the Country selected during startup (nonadjustable).

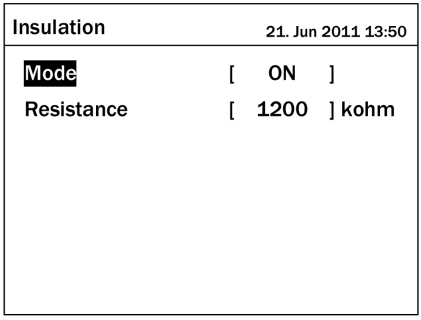


Figure 7.15.: Insulation Settings - Installer Mode

7.3.6.3 Active/Reactive Power control for DE LVD and DE MVD

Below is an overview of the features that are adjustable to control the production of active and reactive power for Germany LVD and MVD

Feature	Available for		Description
	LVD	MVD	
Active power control			

Feature	Available for		Description
	LVD	MVD	
Power limit	x	x	To reduce the maximum power production
Power vs. frequency	x	x	To set the power gradiant in dependency of the frequency
Reactive power control			
Constant cos φ	x	x	To set a fixed cos φ (inductive or capacative)
cos φ (p)	x	x	To set a cos φ (inductive or capacative) in dependency of the active power ratio P/P_n
Constant reactive power		x	To set the reactive power ratio Q/S_n. For MVD grids only.
Q (V)		x	To set the reactive power ratio Q/S_n in dependency of the voltage V. For MVD grids only.

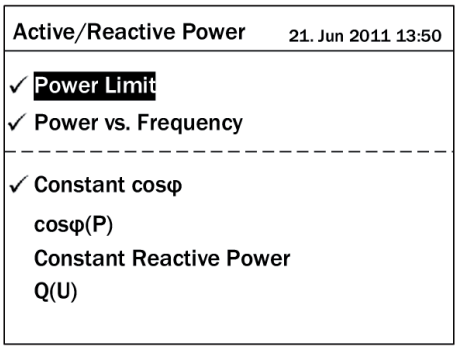
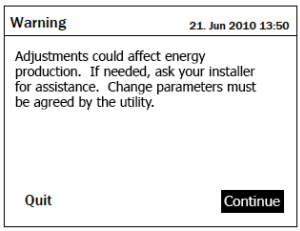


Figure 7.16.: Active/Reactive Power settings page



Note: Before adjusting the Active/Reactive Power settings, a Warning window will be displayed, that you should read and make a selection to continue or to quit. Please see caution messages below related to adjusting the settings.

CAUTION

Machine and equipment damage may occur.

- ► Please only adjust active and reactive power settings if you are a qualified electrical technician with the knowledge to do so
- ► Adjustments may affect energy production
- ► Some values entered in the Active/Reactive Power settings must come from the local grid operator. Please check with them before making any adjustments

7.3.6.3.1 Power Limit

User can select set percentage of actual or rated power to limit inverter's output power. Inverter will start the action once the user sets the Mode to "ON". This feature is available for LVD and MVD grids.

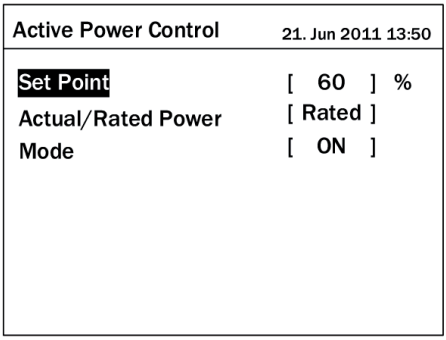


Figure 7.17.: Power Limit settings page

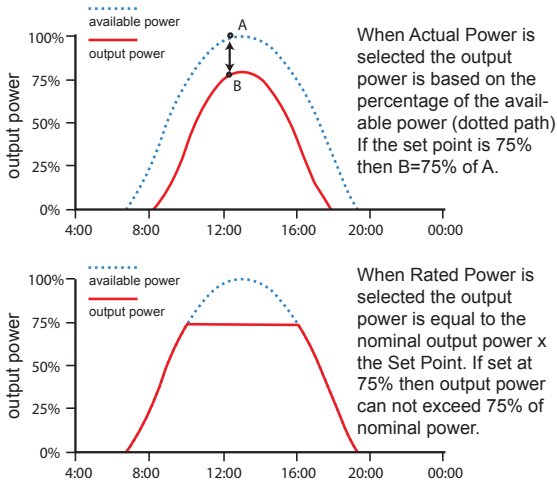


Figure 7.18.: Actual Power vs Rated Power

Parameter	Adjustable Values	Description
Set point	0 ... 100%	Sets the power reduction to the adjusted value. The value is multiplied with the value of the Locked power limitation.
Actual/Rated	Actual | Rated	Select Actual or Rated Power
Mode	ON | OFF	Switches the feature on and off.

7.3.6.3.2 Power vs. Frequency

User can have two modes: LVD and MVD. The figures below explain the different behaviors for these modes. The inverter activates these modes depending on the country that is selected and the requirements for that country.

This feature is available for LVD and MVD grids. This feature allows the user to set a power reduction in a percent of the maximum power.

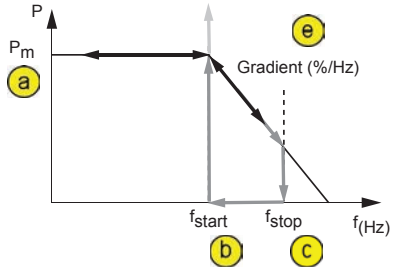


Figure 7.19.: LVD Curve power vs. frequency

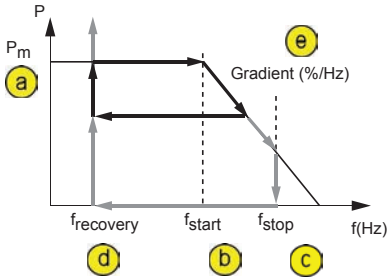


Figure 7.20.: MVD Curve power vs. frequency

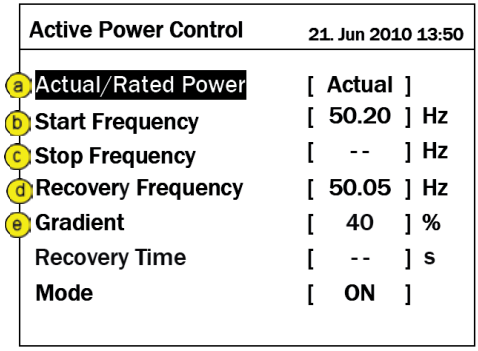


Figure 7.21.: Power vs. Frequency

NOTE

The Power vs Frequency function is required for LVD and MVD. Please make sure the Mode is ON and do not turn off.

Adjustable parameters

Parameter	Adjustable Values	Description
Actual / Rated Power		Actual or Rated can be selected
Start frequency	50.00 ... 55.00	The frequency when the power reduction starts
Stop frequency		Stop frequency means the frequency when power = 0. This value is calculated by the gradient and the start frequency.
Recovery frequency	50.00 ... 55.00	This feature is only for MVD. This value is equal to the frequency of the grid connection.
Gradient	0 ... 100 %	This feature adjusts the gradient. The units are % / Hz.
Recovery Time		Not applicable for LVD or MVD
Mode	ON | OFF	Switches the feature on and off

7.3.6.3.3 Constant cos φ

This feature is available for LVD and MVD grids. This feature allows the user to set up a constant cos φ.

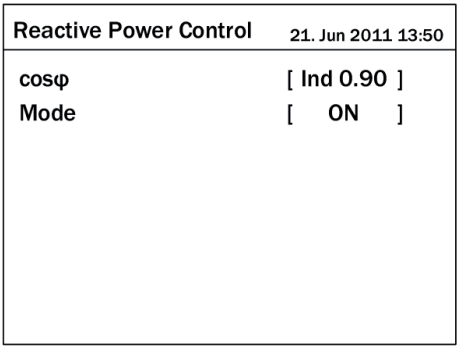


Figure 7.22.: Constant cos φ settings page

Adjustable parameters

Parameter	Adjustable values	Description
cos φ	inductive | capacitive	Sets the cos φ to the adjusted value.
	Ind 0.8 ... Ind 0.99, 1, Cap 0.8 ... Cap. 0.99	
Mode	ON | OFF	Switches the feature on and off

7.3.6.3.4 cosφ(P)

This feature is available for LVD and MVD grids.

With this feature a cos φ can be assigned to a power ratio P/Pn.

The following curve is an example how the values could be set:

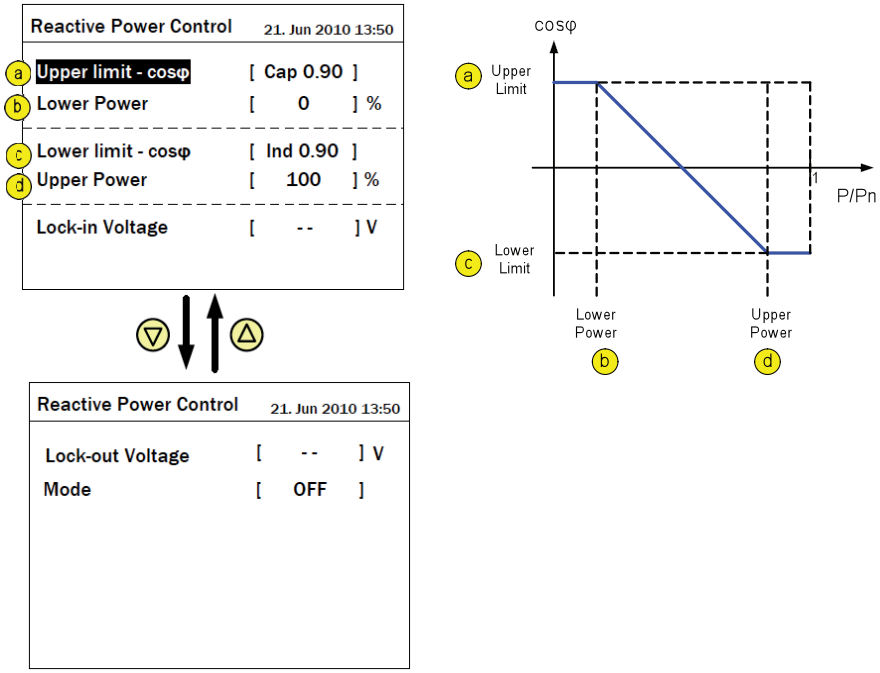


Figure 7.23.: cos φ(P) settings page

Adjustable parameters

Parameter	Adjustable values	Description
Upper limit - cos φ	Ind 0.80 ... Cap 0.80	The upper limit cos φ must be greater than the lower limit cos φ
Lower Power	0 ... 100 %	
Lower limit - cos φ	Ind 0.80 ... Cap 0.80	
Upper Power	0 ... 100 %	The upper power must be greater than the lower power
Lock-in Voltage		Not used for DE LVD/MVD
Lock-out Voltage		Not used for DE LVD/MVD
Mode	ON I OFF	This switches the feature on and off

7.3.6.3.5 Constant Reactive Power

This feature is available for MVD grids only.

This feature allows a constant cos reactive power to be set.

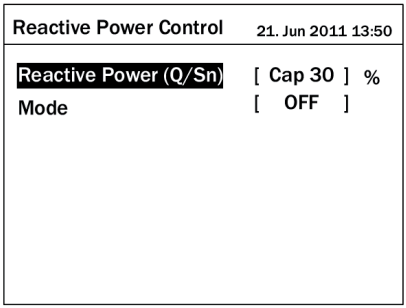


Figure 7.24.: Constant Reactive Power settings page

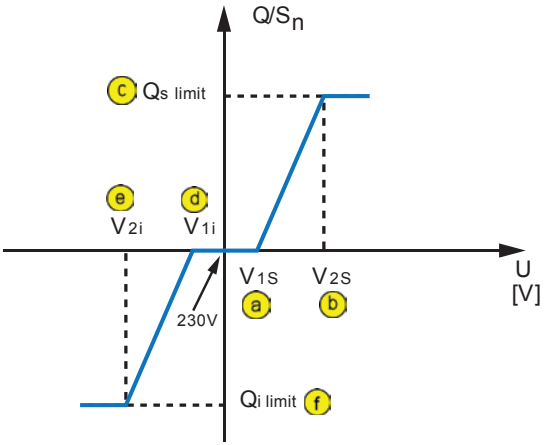
Adjustable parameters

Parameter	Adjustable values	Description
Reactive power Q/Sn	-60 ... +60% inductive | capacitive	Reactive power ratio in relation to apparent power.
Mode	ON I OFF	This switches the feature on and off

7.3.6.3.6 Q(V)

This feature is available for MVD grids only.

This feature allows the reactive power ratio Q/Sn to be assigned to a voltage V



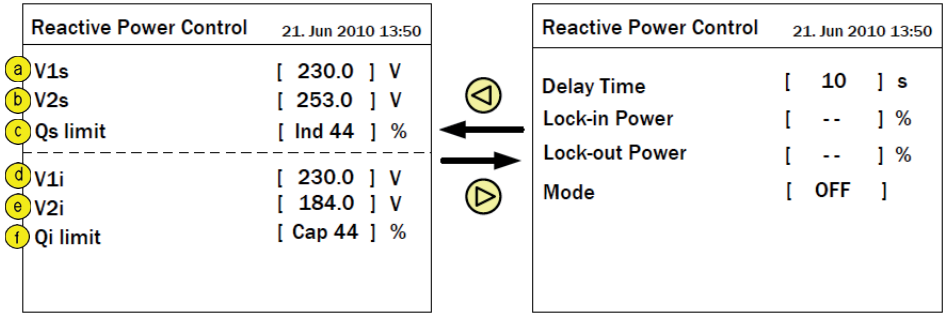


Figure 7.25.: Q(V) settings page

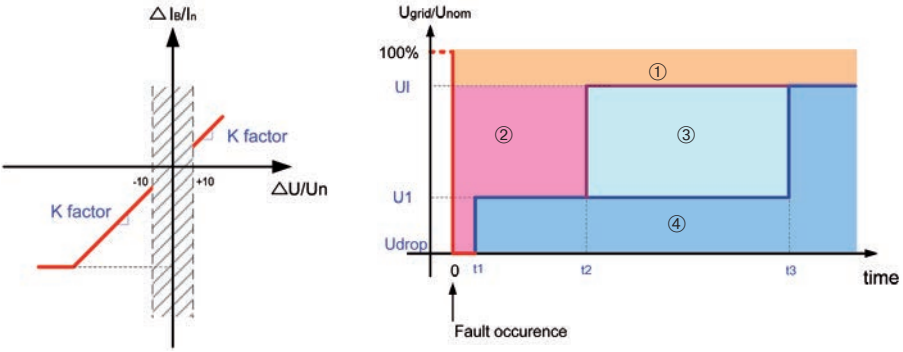
Adjustable parameters

Parameter	Menu Name	Adjustable values	Description
Lower Q/Sn	Qi Limit	0 ... 60% inductive | capacitive	Must be within the range Ind 60% ... Cap 60%
Upper Q/Sn	Qs Limit	0 ... 60% inductive | capacitive	Must be within the range Ind 60% ... Cap 60%
Lower capacitive point	V2i	184 ... 264 V	
Upper capacitive point	V1i	184 ... 264 V	For DE MVD the default V1i = V1s = 230 V
Lower inductive point	V1s	184 ... 264 V	
Upper inductive point	V2s	184 ... 264 V	
Delay time		0 ... 10 s	
Lock-in Power		not applicable	Not used for DE MVD
Lock-out Power		not applicable	Not used for DE MVD
Mode		ON I OFF	This switches the feature on and off

7.3.6.3.7 Fault Ride Through (FRT)

This feature is available for MVD grids only.

This feature allows the Fault Ride Through features to be set.



① No instability or disconnection from the network

② Feed-in reactive current depends on K factor

③ Same as area 2, Feed-in reactive current depends on K factor

④ Disconnects from the network

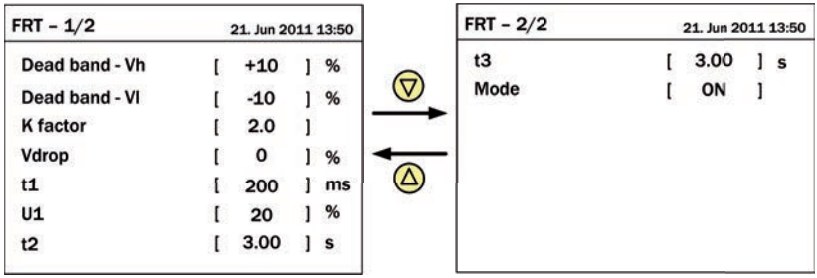


Figure 7.26.: Fault Ride Through settings page

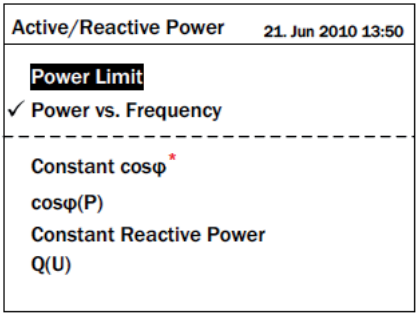
Adjustable parameters

Parameter	Adjustable values	Description
Dead band - Vhigh	+0 ... +20 %	
Dead band - Vlow	-20 ... 0 %	
K factor	0 ... 10	
Vdrop	0 ... 90%	
t1	0 ... 500 ms	
U1	20 ... 90%	
t2	0.01 ... 5 s	
t3	0.01 ... 5 s	
Mode	ON | OFF	This switches the feature on and off

7.3.6.4 Active/Reactive Power control for Italy CEI 0-21 and Italy A70

Below is an overview of the features that are adjustable to control the production of active and reactive power for Italy CEI 0-21 and Italy A70. Italy CEI 0-21 is applicable for low voltage grids and A70 is applicable for medium voltage grids.

Feature	Available for		Description
	CEI 0-21	A70	
Active power control			
Power limit	x	x	To reduce the maximum power production
Power vs. frequency	x	x	To set the power gradiant in dependency of the frequency
Reactive power control			
Constant cos φ			This feature is not available for CEI 0-21 and A70.
cos φ (p)	x	x	To set a cos φ (inductive or capacative) in dependency of the active power ratio P/P_n
Constant reactive power	x	x	To set the reactive power ratio Q/S_n.
Q (V)	x	x	To set the reactive power ratio Q/S_n in dependency of the voltage V.



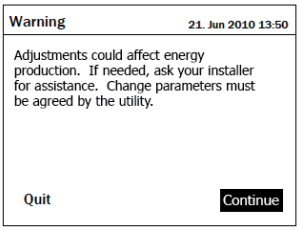
Note: User can activate both the Power Limit and the Power vs. Frequency at the same time.

For the reactive power control features: cosφ(P), Constant Reactive Power, and Q(V) only one of these items can be activated at a time.

✓ indicates a function is executing

* This feature is disabled for CEI 0-21 and A70 although it will appear in the menu

Figure 7.27.: Active/Reactive Power settings page



Note: Before adjusting the Active/Reactive Power settings, a Warning window will be displayed, that you should read and make a selection to continue or to quit. Please see caution messages related to adjusting the settings.

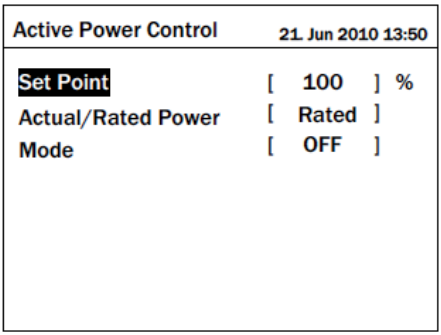
CAUTION

Machine and equipment damage may occur.

- ► Please only adjust active and reactive power settings if you are a qualified electrical technician with the knowledge to do so
- ► Adjustments may affect energy production
- ► Some values entered in the Active/Reactive Power settings must come from the local grid operator. Please check with them before making any adjustments

7.3.6.4.1 Power Limit

User can select set percentage of actual or rated power to limit inverter's output power. Inverter will start the action once the user sets the Mode to "ON". This feature is available for Italy CEI 0-21 and Italy A70.



Note: For explanation of Actual vs Rated Power please see figure 7.18.

Figure 7.28.: Power Limit settings page

Adjustable parameters

Parameter	Adjustable Values	Description
Set point	0 ... 100%	Sets the power reduction to the adjusted value. The value is multiplied with the value of the Locked power limitation.
Actual/Rated	Actual | Rated	Select Actual or Rated Power
Mode	ON | OFF	Switches the feature on and off.

7.3.6.4.2 Power vs. Frequency

This function is available for CEI 0-21 and A70. The figure below explain the behavior of this function. Note that the Italy CEI 0-21 and A70 curves are different than the Germany LVD and MVD curves.

This feature allows the user to set a power reduction in a percent of the maximum power.

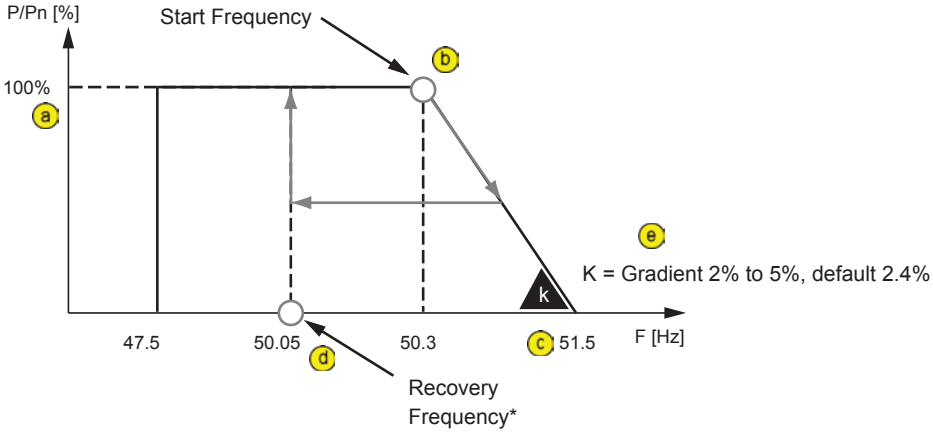
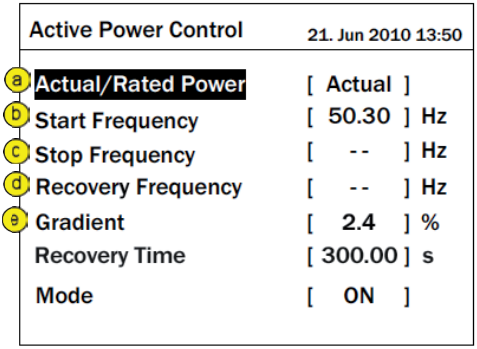


Figure 7.29.: Curve power vs. frequency



NOTE

The Power vs Frequency function is required for CEI 0-21 and A70. Please make sure the Mode is ON and do not turn off.

*Recovery Frequency is defined in the grid setting parameters 49.9 - 50.1 Hz by default.

Figure 7.30.: Power vs. Frequency

Adjustable parameters

Parameter	Adjustable Values	Description
Actual / Rated Power		Actual will be default
Start frequency	50 - 55 Hz	50.3 Hz will be the default. This is the frequency when the power reduction starts
Stop frequency		Stop frequency means the frequency when power = 0. This value is calculated by the gradient and the start frequency.
Recovery frequency	Nonadjustable	
Gradient	2.0 ... 5.0 %	2.4 % is the default
Recovery time	300 seconds	
Mode	ON | OFF	Switches the feature on and off

7.3.6.4.3 Constant cosφ

This feature is not available for CEI 0-21 or A70.

7.3.6.4.4 cosφ(P)

This feature is available for Italy CEI 0-21 and Italy A70.

With this feature a solar inverter can regulate the power factor as a function of the actual delivered active power.

The following graph is an example how the values could be set:

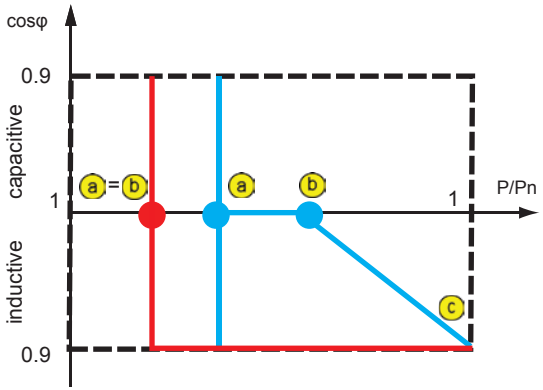


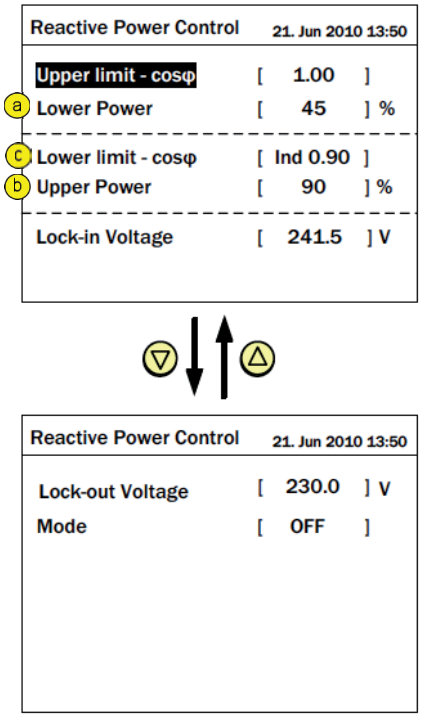
Figure 7.31.: cos*φ(P) graph*

There are two possible curves defined in the cos*φ(P) graph, curve A in blue (the default) and curve B in red.* Pn = nominal power

Curve A (in blue on Figure 7.31)
A is identified from Plock-out = value from local grid operator and cosφ = 1
B is identified from Plock-in = value from local grid operator and cosφ = 1
C is identified from P = Pn and cos = cosφmax

Curve B (in red on Figure 7.31)
A is identified from Plock-out = P = value from local grid operator and cosφ = 1
B is identified from Plock-in = value from local grid operator and cosφ = 1
C is identified from P = Pn and cos = cosφmax

Important:
When Plock-out = Plock-in then Curve B will be followed.
When Plock-out is ≠ Plock-in then Curve A will be followed.



Notes:

In the formulas on the previous page, the parameters mentioned are named differently as in the menu page

Curve A (in blue) Figure 6.30

Point A = Plockout = Lower Power

Point B = Plockin = Upper Power

Point C = Lower limit • cosφ

Curve A is followed when Lower Power is not equal to Upper Power

Curve B (in Red) Figure 6.30

Point A (Lower Power) = Point B (Upper Power)

Point C = Lower limit • cosφ

Curve B is followed when Lower Power = Upper Power

Figure 7.32.: cos φ(P) settings page

Adjustable parameters for cos φ(P)

Parameter	Adjustable values	Curve A	Curve B
Upper limit - cos φ	Ind 0.80 ... Cap 0.80	Cap 1.0	Cap 1.0
Lower Power	0 ... 100 %	45% is shown but adjust to grid operator requested value	should equal Upper Power
Lower limit - cos φ	Ind 0.80 ... Cap 0.80	Ind 0.90	Ind 0.90
Upper Power	0 ... 100 %	90% is shown but adjust to grid operator requested value	should equal Lower Power
Lock-in Voltage*	230-253 V	241.5 V is default value and is 1.05Vn (Vn = 230V)	
Lock-out Voltage*	207-230 V	230 V is default value (adjustable at 0.98 Vn to Vn; Vn=230V). When the grid voltage ≤ the Lock-out voltage	

Parameter	Adjustable values	Curve A	Curve B
Mode	ON I OFF	This switches the feature on and off. Default mode is OFF.	

*These values are only adjustable if Country setting is Italy CEI-021 or Italy A70. This means the inverter will feed in reactive power depending on the active power once the grid voltage is higher than Lock-in Voltage. When grid voltage is lower than Lock-out voltage then inverter would go back to pure active power control.

For countries other than Italy, cos φ(P) control would not be effected by the grid voltage.

7.3.6.4.5 Constant Reactive Power

This feature is available for Italy CEI 0-21 and Italy A70.

This feature allows a constant cos reactive power to be set.

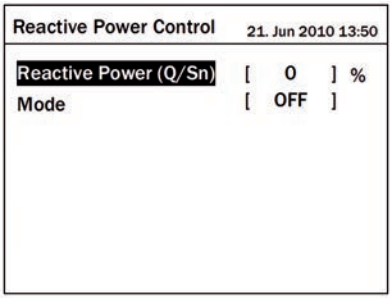


Figure 7.33.: Constant Reactive Power settings page

Adjustable parameters

Parameter	Adjustable values	Description
Reactive power Q/Sn	-60 ... +60% inductive | capacitive	Reactive power ratio in relation to apparent power. Enter the value requested by the grid operator
Mode	ON I OFF	This switches the feature on and off

7.3.6.4.6 Q(V)

This feature is available for Italy CEI 0-21 and Italy A70.

This feature allows the reactive power ratio Q/Sn to be assigned to a voltage V.

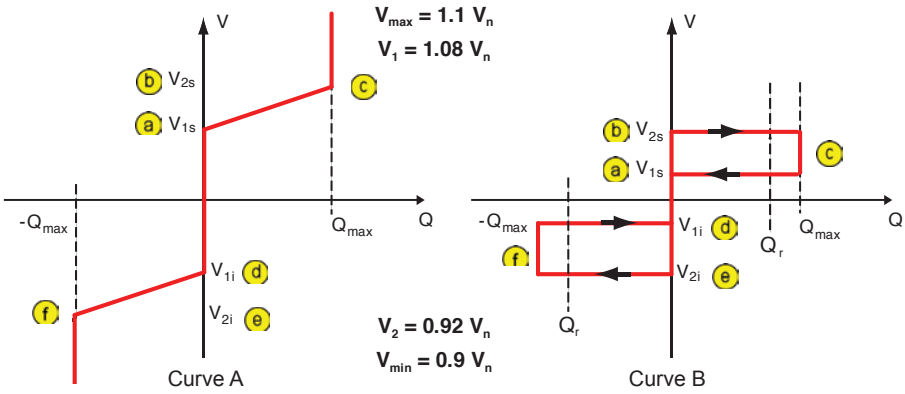
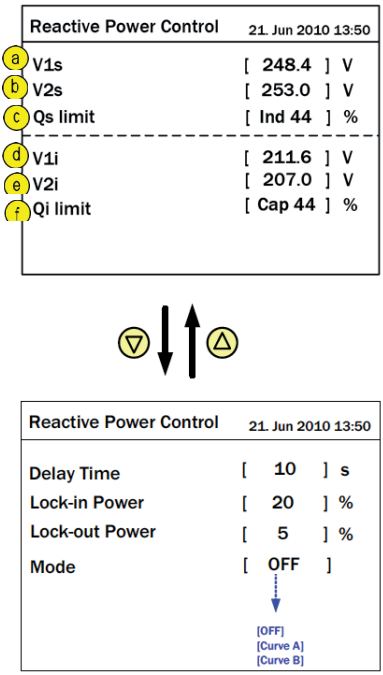


Figure 7.34.: Q(V)



Note: Qs limit and Qi limit are calculated based on Q/Sn.

Figure 7.35.: Q(V) Settings Page

Adjustable parameters

Parameter	Adjustable values	Description
Qs limit (Q/Sn)	0 ... 60% inductive | capacitive	Ind 44%
Qi limit (Q/Sn)	0 ... 60% inductive | capacitive	Cap 44%
V1s	230 ... 264.5 V	248.4 V
V2s	230 ... 264.5 V	253 V
V1i	184 ... 230 V	211.6 V
V2i	184 ... 230 V	207 V
Plock-in*	10 ... 100%	20% is shown but use value from the grid operator
Plock-out*	5 ... 10%	5% is shown but use value from the grid operator
Delay time	0 ... 120 s	10 s
Mode	Curve A I Curve B I OFF	This switches between Curve A and Curve B or OFF

*This item is only adjustable and enabled if Country settings is Italy CEI 0-21 or Italy A70.

7.3.6.4.7 LVFRT Low Voltage Fault Ride Through (LVFRT)

This feature is available for CEI 0-21 and A70.

This feature allows the Fault Ride Through features to be set.

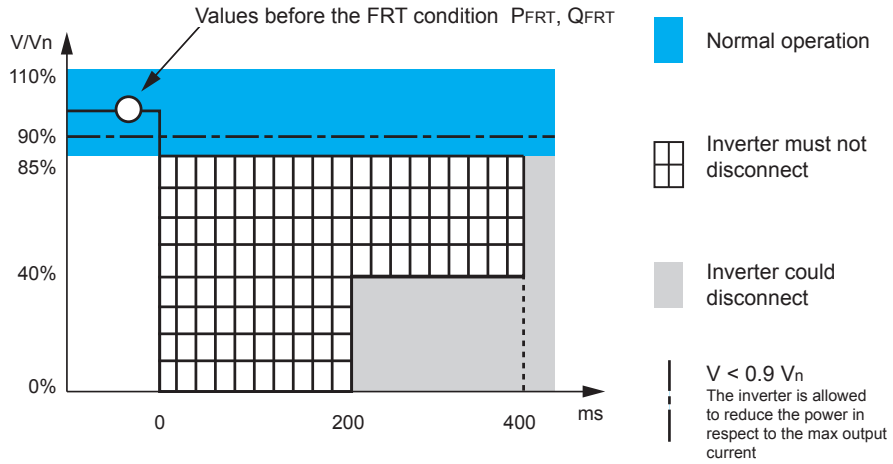


Figure 7.36.: Low Voltage Fault Ride Through graph

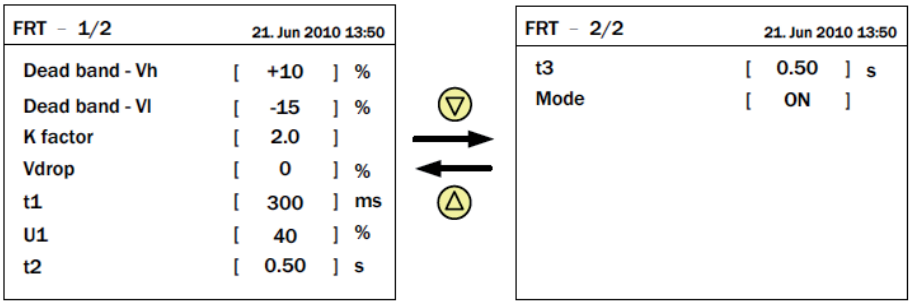


Figure 7.37.: Fault Ride Through settings page

Adjustable parameters

Parameter	Adjustable values	Description
Dead band - Vhigh	+0 ... +20 %	10%
Dead band - Vlow	-20 ... 0 %	-15%
K factor	Do not adjust	
Vdrop	Do not adjust	
t1	Do not adjust	
U1	Do not adjust	
t2	Do not adjust	
t3	Do not adjust	
Mode	ON | OFF	This switches the feature ON and OFF

7.3.6.5 Reactive Power Control for Slovenia (SONDO) for 15 / 20 / 30 TL

When selecting Slovenia from the Country setting list on initial start up, it is possible to adjust reactive power parameters for Q(V) according to two curves, class B and class C. The Slovenian requirements are known as SONDO or SOIEDN (System operation instructions for electricity distribution network). Q(V) is the reactive power ratio Q/S_n in dependency of the voltage V.

CAUTION

Machine and equipment damage may occur.

- ► Please only adjust these reactive power settings if you are a qualified electrical technician with the knowledge to do so
- ► Adjustments may affect energy production
- ► Some values entered in the Reactive Power settings must come from the local grid operator. Please check with them before making any adjustments

NOTE

The inverter is only able to feed-in reactive power in Class B or Class C settings when the Power output is greater than 5% of Pn.

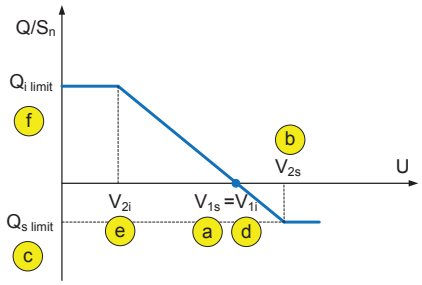


Figure 7.38.: SONDO Class B curve

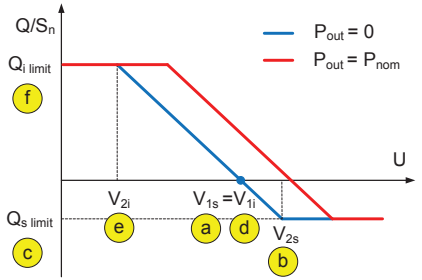


Figure 7.39.: SONDO Class C curve

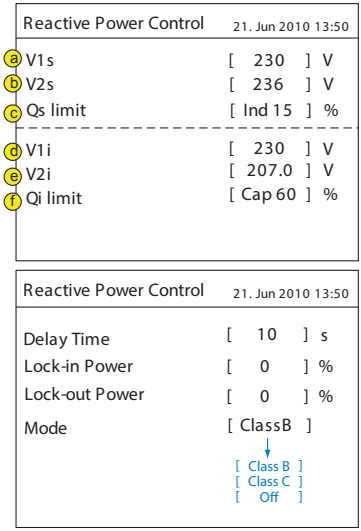


Figure 7.40.: Q(V) settings

Adjustable parameters (Class C)

Parameter	Adjustable values	Description
Qs limit (Q/Sn)	0 ... 63% inductive	Ind 15%
Qi limit (Q/Sn)	0 ... 63% capacitive	Cap 60%
V1s	230 ... 264.5 V	default 230 V
V2s	230 ... 264.5 V	default 236 V (limit 264.5 / V1s < V2s)
V1i	184 ... 230 V	default 230 V
V2i	184 ... 230 V	default 207 V (V2i < V1i)
Lock-in Power	0	Not applicable
Lock-out Power	0	Not applicable
Delay time	0 ... 120 s	10 s
Mode	Class B I Class C I OFF	This switches between Class B and Class C or OFF

Note: At the time of the manual printing, SONDO Class C was implemented in the inverter, but not yet Class B. Please check for Class B setting availability on our web site at www.solar-inverter.com. We will post the certificate for SONDO Class B when it is available.

8. Maintenance

In order to ensure the normal operation of the PV Inverter, please check it regularly at least once every 6 months. Check that all the terminals, screws, cables are securely in place. If there are any damaged parts, please contact a qualified technician to repair it or to replace it with a new spare part. To ensure that no foreign contaminants enter the warm air outlets, please have them cleaned every 6 months by qualified technicians.

WARNING

Death and serious injury may occur!

► Before engaging in maintenance of the inverter, please disconnect AC and DC power to avoid risk of electric shock.!

8.1 Cleaning the Fans

Loosen the 4 screws in the four corners of the fan bracket first (circled below). Pulling the bracket slightly away from the inverter, the user will notice 4 sets of fan connectors. Disconnect the fan connectors one by one and then pull the fan bracket from the inverter for cleaning. If a fan is not operating correctly, then the entire fan assembly must be replaced. Call the support hotline for assistance in procuring a new replacement fan assembly.

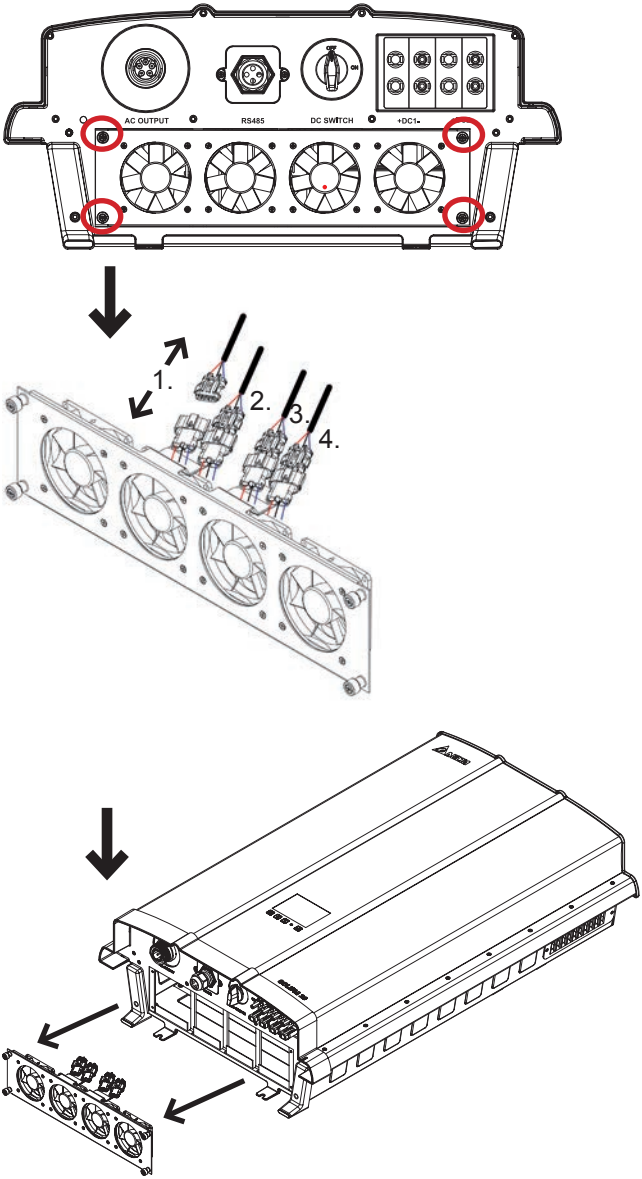


Figure 8.1.: Steps of removing the fan bracket from the inverter

8.2 Replace a Fan Assembly

If one of the fans has failed it is necessary to order a new fan assembly and replace it. User should remove the fan bracket with faulty fan as shown in figure 8.1. Four thumb screws (circled below) attach the fan bracket to the inverter. Loosen the 4 thumb screws and pull the fan bracket from the inverter carefully and then disconnect the four pairs of fan electrical connectors (or single pair of fan electrical connectors for 6.0 / 8.0 / 10 / 12 TL). Follow the procedure in reverse to install a new fan assembly. Call the support hotline for assistance in procuring a new replacement fan assembly. See the part numbers for the fan assemblies in table 8.1.

Note: The fan bracket shown is for the 15 TL, 20 TL, and 30 TL. The 6.0 / 8.0 TL / 10 TL / 12 TL fan bracket will have just one fan.

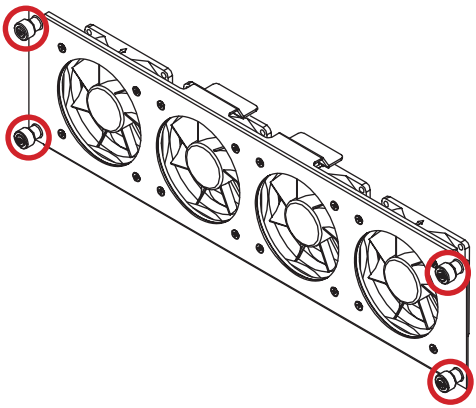


Figure 8.2.: Removing the fan assembly

	Designation	Part number Delta
	FAN ASSEMBLY FOR SOLIVIA 6.0 TL, 8.0 TL, 10 TL, and 12 TL	EOE90000532
	FAN ASSEMBLY FOR SOLIVIA 15 TL and 20 TL	EOE90000530

	Designation	Part number Delta
	FAN ASSEMBLY FOR SOLIVIA 30 TL	EOE90000531

Table 8.1.: Fan Assembly Part Numbers

8.3 Cleaning the Air Outlets

Figure 8.3 shows the removal of the vent covers for cleaning. First remove the 4 screws that hold the vent cover to the inverter enclosure. Next, remove the vent cover from the inverter. With the vent cover removed, clean it on both sides. After cleaning one of the vents, proceed to take off the vent on the opposite side and clean in the same manner. Reinstall the vent covers securely after they have been cleaned. The cleaning of the air outlets as described above should be done on a regular basis for optimum inverter performance.

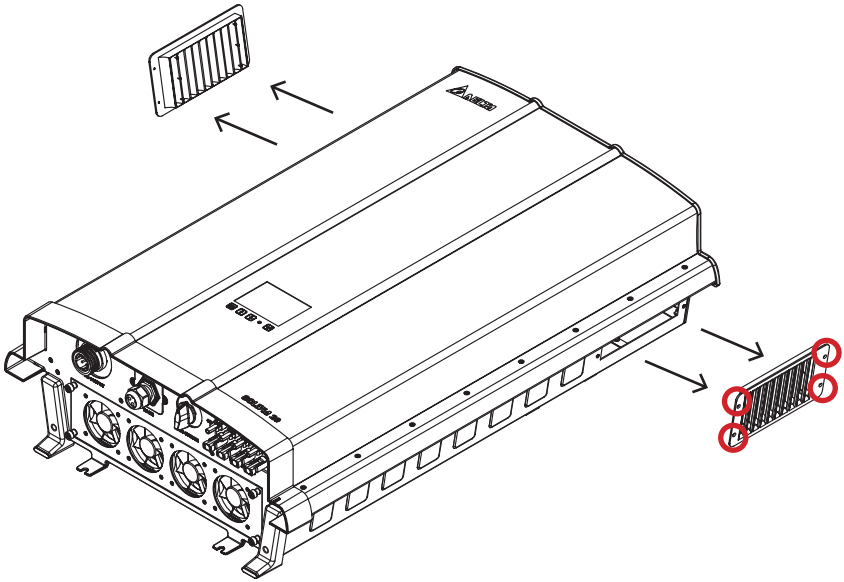


Figure 8.3.: Removing the Vent Covers for Cleaning

9. Measurements and Messages

9.1 Measurements

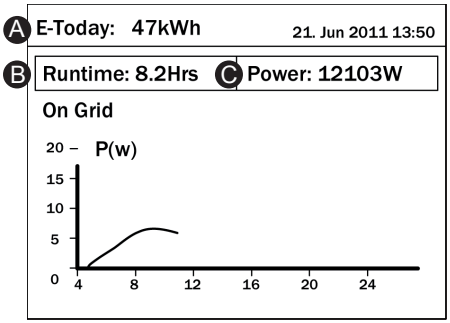


Figure 9.1.: Measurements on the Home Page

	Measurement	Description
A	E-Today	Total energy generated today
B	Runtime	Total PV inverter operation time for the day
C	Power	Actual power being generated

Table 9.1.: Home Page Measurements and Description

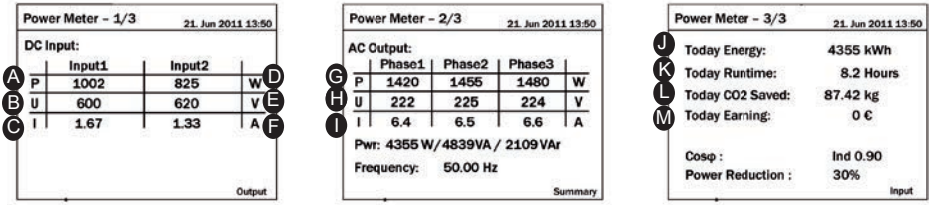


Figure 9.2.: Measurements on the Power Meter Pages

	Measurement	Description
A	Input 1 P	Power of DC Input 1
B	Input 1 V	Voltage of DC input 1
C	Input 1 I	Current of DC input 1
D	Input 2 P	Power of DC input 2
E	Input 2 V	Voltage of DC input 2
F	Input 2 I	Current of DC input 2
G	Output P	Power of AC Output
H	Output V	Voltage of AC Output
I	Output I	Current of AC Output
J	Today Energy	Total accumulated electricity generated for the day
K	Today Runtime	Total accumulated operation time for the day
L	Total CO2 saved	Total accumulated CO2 emissions retrenched to present time
M	Today Earning	Total accumulated Euro amount earned for the day

Table 9.2.: Power Meter Pages Measurements and Description

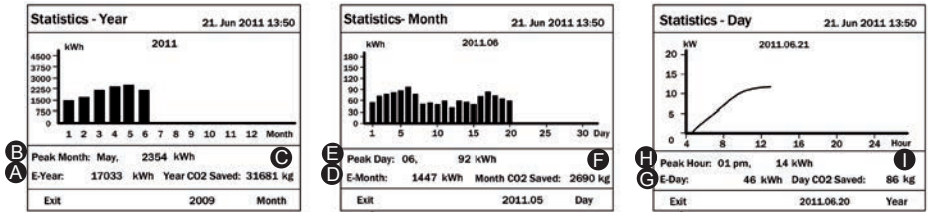


Figure 9.3.: Measurements on the Statistics Pages

	Measurement	Description
A	E-Year	Total accumulated electricity generated in a year
B	Peak Month	The peak month of electricity generated in the past year
C	Year CO2 saved	Total accumulated CO2 emissions retrenched in a year
D	E-Month	Total accumulated electricity generated in a month
E	Peak Day	The peak day of electricity generated in the past month
F	Month CO2 saved	Total accumulated CO2 emission retrenched in a month
G	E-Day	Total accumulated electricity generated in a day
H	Peak Hours	The peak hour of electricity generated in the past day
I	Day CO2 saved	Total accumulated CO2 emission retrenched for a day

Table 9.3.: Statistics Pages Measurements and Description

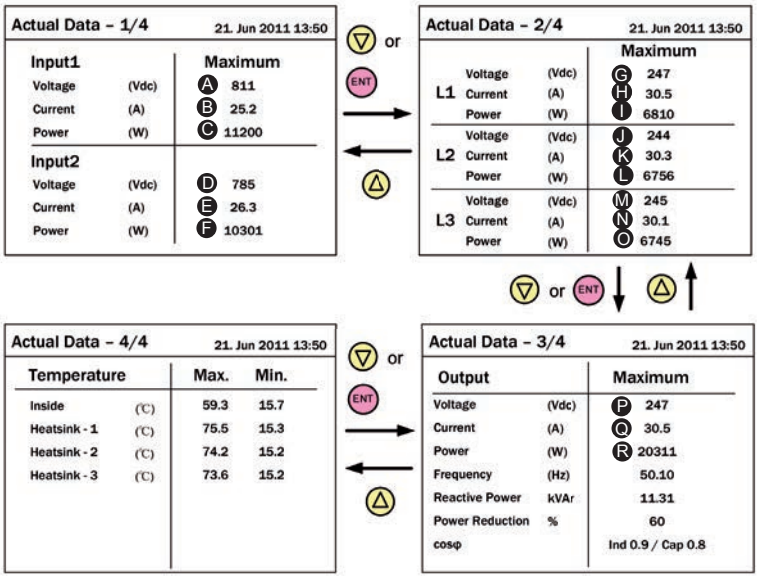


Figure 9.4.: Measurements on the Actual Data Pages

	Measurement	Description
A	Input 1 Volt. maximum	The maximum DC input 1 voltage
B	Input 1 I maximum	The maximum DC input 1 current
C	Input 1 P maximum	The maximum DC input 1 power
D	Input 2 Volt. maximum	The maximum DC input 2 voltage
E	Input 2 I maximum	The maximum DC input 2 current
F	Input 2 P maximum	The maximum DC input 2 power
G	L1 Volt. maximum	The maximum AC L1 phase voltage
H	L1 I maximum	The maximum AC L1 phase current
I	L1 P maximum	The maximum AC L1 phase power
J	L2 Volt maximum	The maximum AC L2 phase voltage
K	L2 I maximum	The maximum AC L2 phase current
L	L2 P maximum	The maximum AC L2 phase power
M	L3 Volt. maximum	The maximum AC L3 phase voltage
N	L3 I maximum	The maximum AC L3 phase current
O	L3 P maximum	The maximum AC L3 phase power
P	Output Volt. maximum	The maximum AC 3 phase voltage
Q	Output I maximum	The maximum AC 3 phase current
R	Output P maximum	The maximum AC 3 phase power

Table 9.4.: Actual Data Pages Measurement and Description

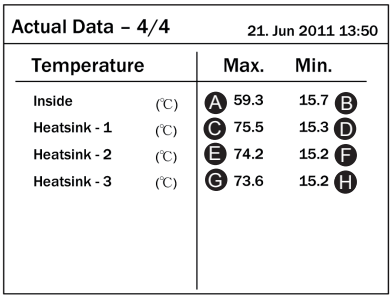


Figure 9.5.: Measurements of Temperature on the Actual Data Pages

	Temperature	
A	Inside max.	The maximum inverter inner temperature value
B	Inside min.	The minimum inverter inner temperature value
C	Heatsink-1 max.	The maximum Heatsink-1 temperature value
D	Heatsink-1 min.	The minimum Heatsink-1 temperature value
E	Heatsink-2 max.	The maximum Heatsink-2 temperature value
F	Heatsink-2 min.	The minimum Heatsink-2 temperature value
G	Heatsink-3 max.	The maximum Heatsink-3 temperature value
H	Heatsink-3 min.	The minimum Heatsink-3 temperature value

Table 9.5.: Temperature Measurement and Description

9.2 Messages

Message	Red LED on	Red LED blinks	Description
Errors			
AC Freq High	X		Grid frequency is over rating
AC Freq Low	X		Grid frequency is under rating
Grid Quality	X		Poor grid quality
HW Connect Fail	X		Can't detect grid sequence
No Grid	X		Grid voltage < 100V
AC Volt Low	X		Phase-L1, L2, or L3 voltage is under rating
AC Volt High	X		Phase-L1, L2, or L3 voltage is over rating
Solar1 High	X		DC1 voltage > 1000V
Solar2 High	X		DC2 voltage > 1000V
Faults			
HW DC Injection	X		DC injection is over rating
Temperature	X		Ambient, heatsink, or choke temperature is higher or lower than the normal operation range
HW NTC1 Fail	X		Temperature sensor 1 has failed
HW NTC2 Fail	X		Temperature sensor 2 has failed
HW NTC3 Fail	X		Temperature sensor 3 has failed
HW NTC4 Fail	X		Temperature sensor 4 has failed
Firmware Fail	X		Firmware is incompatible
HW DSP ADC1	X		DSP A/D failure – Vgrid or Iout
HW DSP ADC2	X		DSP A/D failure – Vin or Vbus
HW DSP ADC3	X		DSP A/D failure – Iin or Iboost
HW Red ADC1	X		Red. A/D failure – Vgrid or Vinv
HW Red ADC2	X		Red. A/D failure – Iout_dc
HW Efficiency	X		Efficiency is abnormal
HW COMM2	X		Can't communicate with Red. CPU
HW COMM1	X		Can't communicate with DSP
Ground Current	X		Residual current is over rating
Insulation	X		Array insulation has failed
HW Connected Fail	X		AC internal wire is disconnected
RCMU Fail	X		HW RCMU failure
Relay Test Short	X		One or more relays are defective - short

Message	Red LED on	Red LED blinks	Description
Relay Test Open	X		One or more relays are defective - open
Bus Unbalance	X		Bus voltage is unbalanced
HW Bus OVR	X		BUS or BUS+ or BUS- voltage is over rating
HW Bus UVR	X		BUS+ or BUS- voltage is under rating
AC Current High	X		Phase-L1, L2, or L3 current is over rating
HW CT A Fail	X		Current sensor-L1 failure
HW CT B Fail	X		Current sensor-L2 failure
HW CT C Fail	X		Current sensor-L3 failure
HW AC OCR	X		Output current is over hardware limit
Inverter Failure	X		Inverter Failure
HW ZC Fail	X		HW zero-crossing circuit failure
DC Current High	X		DC1 or DC2 current is over rating
Warnings			
HW FAN		X	Fan is locked or failed during operation
Solar1 Low		X	DC1 voltage is under rating
Solar2 Low		X	DC2 voltage is under rating

10. Troubleshooting

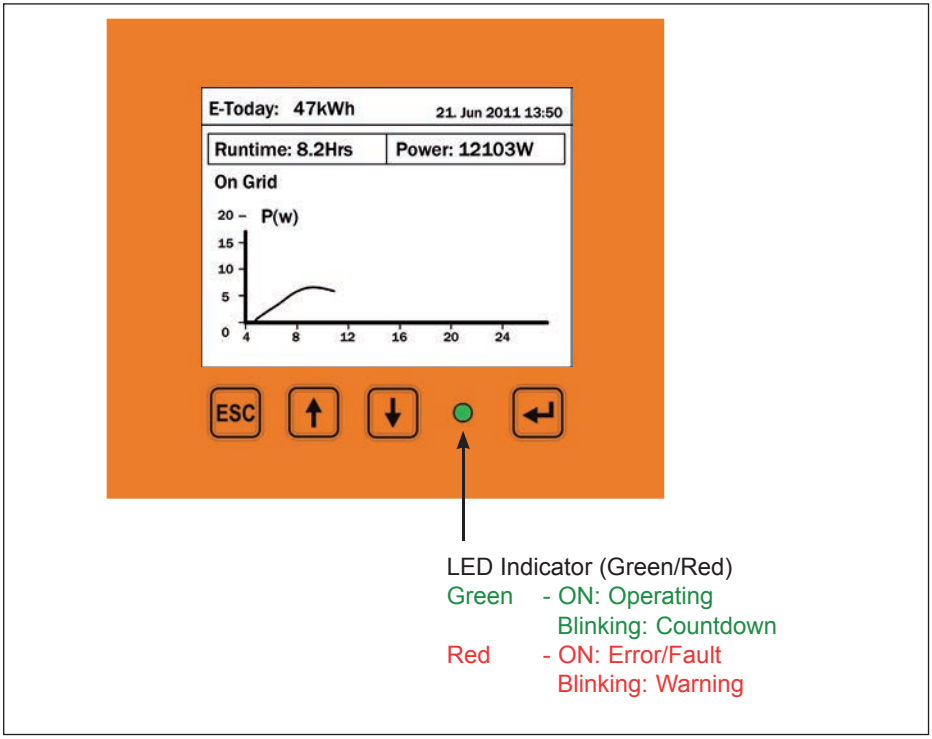


Figure 10.6.: LED Indicator

Message	Red LED on	Red LED blinks	Solution
Errors			
AC Freq High	X		► Check grid frequency on the inverter terminal ► Check the country setting
AC Freq Low	X		► Check grid frequency on the inverter terminal ► Check the country setting
Grid Quality	X		► Check the harmonics of the grid voltage ► Grid connection of the inverter may need to be further away from a non-linear load.

Message	Red LED on	Red LED blinks	Solution
HW Connect Fail	X		► Check the AC connection, must be according to the manual instructions ► Please contact your installation technician or DELTA technical support
No Grid	X		► Check the connection of the AC plug, ensure it is connected to the inverter and the AC breaker is on
AC Volt Low	X		► Check the utility voltage connection to the inverter terminal ► Check the country setting
AC Volt High	X		► Check the utility voltage connection to the inverter terminal ► Check the country setting
Solar1 High	X		► Modify the solar array setting and make the Voc less than 1000 Vdc
Solar2 High	X		► Modify the solar array setting and make the Voc less than 1000 Vdc
Faults			
HW DC Injection	X		► Check the utility waveform. Grid connection of the inverter may need to be further from the non-linear load. ► Please contact your installation technician or DELTA technical support
Temperature	X		► Check the installation ambient and environment
HW NTC1 Fail	X		► Please contact your installation technician or DELTA technical support
HW NTC2 Fail	X		► Please contact your installation technician or DELTA technical support
HW NTC3 Fail	X		► Please contact your installation technician or DELTA technical support
HW NTC4 Fail	X		► Please contact your installation technician or DELTA technical support
Firmware Fail	X		► Please contact your installation technician or DELTA technical support
HW DSP ADC1	X		► Please contact your installation technician or DELTA technical support
HW DSP ADC2	X		► Please contact your installation technician or DELTA technical support
HW DSP ADC3	X		► Please contact your installation technician or DELTA tech. support
HW Red ADC1	X		► Please contact your installation technician or DELTA tech. support

Message	Red LED on	Red LED blinks	Solution
HW Red ADC2	X		► Please contact your installation technician or DELTA tech. support
HW Efficiency	X		► Please contact your installation technician or DELTA technical support
HW COMM2	X		► Please contact your installation technician or DELTA technical support
HW COMM1	X		► Please contact your installation technician or DELTA technical support
Ground Current	X		► Check the insulation of Solar inputs ► Check the capacitance (+<-> GND & - <-> GND), must be < 2.5 µF. Install an external transformer if necessary ► Please contact your installation technician or DELTA technical support
Insulation	X		► Check the insulation of solar inputs ► Please contact your installation technician or DELTA technical support
HW Connected Fail	X		► Please contact your installation technician or DELTA technical support
RCMU Fail	X		► Please contact your installation technician or DELTA technical support
Relay Test Short	X		► Please contact your installation technician or DELTA technical support
Relay Test Open	X		► Please contact your installation technician or DELTA technical support
Bus Unbalance	X		► Check the inputs connections ► Check the PV Array insulation ► Please contact your installation technician or DELTA technical support
HW Bus OVR	X		► Check the inputs connections ► Check the PV Array insulation ► Please contact your installation technician or DELTA technical support ► Modify the solar array setting and make the Voc less than 1000 Vdc
AC Current High	X		► Please contact your installation technician or DELTA technical support if it will not go back to normal operation
HW CT A Fail	X		► Please contact your installation technician or DELTA technical support if it will not go back to normal operation
HW CT B Fail	X		► Please contact your installation technician or DELTA technical support if it will not go back to normal operation

Message	Red LED on	Red LED blinks	Solution
HW CT C Fail	X		► Please contact your installation technician or DELTA technical support if it will not go back to normal operation
HW AC OCR	X		► Please contact your installation technician or DELTA technical support if it will not go back to normal operation
Inverter Failure	X		► Please contact your installation technician or DELTA technical support if it will not go back to normal operation
HW ZC Fail	X		► Please contact your installation technician or DELTA technical support
DC Current High	X		► Please contact your installation technician or DELTA technical support if it will not go back to normal operation
Warnings			
HW FAN		X	► Remove the object that is stuck in the fan(s) ► Replace the defective fan(s) ► Check the connections of all fans
Solar 1 Low		X	► Check the DC1 voltage connection to the inverter terminal ► Check all switching devices in boost1
Solar 2 Low		X	► Check the DC2 voltage connection to the inverter terminal ► Check all switching devices in boost2

Table 10.1.: Troubleshooting Message/Solution Description

11. Decommissioning

Decommissioning Procedure

If it is necessary to put the SOLIVIA TL out of operation for return or maintenance, please follow the instructions below:

WARNING

Death and serious injury may occur.

To avoid injuries, please follow the below procedures:

1. Switch off AC circuit breaker to disconnect with electrical grid.
2. Switch off the DC Disconnect switch to disconnect with DC power input.
3. Use the proper voltage meter to confirm that the AC and DC power connections are void of any current.
4. Remove the AC wiring immediately to completely disconnect with electrical grid.
5. Remove the DC wiring to disconnect with PV array.
6. Remove the Communication module RS485 with the computer connection.
7. After finishing all the procedures, you can remove the SOLIVIA TL inverter from the mounting bracket.

12. Technical data

12.1 Specification

		6.0EUT4TL	8.0EUT4TL	10EUG4TL	12EUG4TL
INPUT (DC)					
Max. recommended PV power [1]	kW_P	7.8	10.0	13.2	15.6
Recommended PV power range	kW_P	5.5 ... 7.8	7.0 ... 10.0	8.8 ... 13.2	10.4 ... 15.6
Nominal power	kW	6.3	8.4	10.5	12.6
Operating voltage	V	250 ... 1000 V			
MPP Voltage range					
Symmetrical load (50/50%)	V_{DC}	315 ... 850	280 ... 850	350 ... 850	420 ... 850
Asymmetrical load (67/33%)	V_{DC}	420 ... 850	330 ... 850	350 ... 850	420 ... 850
Asymmetrical load (33/67%)	V_{DC}	250 ... 850	280 ... 850		
Nominal voltage	V_{DC}	635			
Start up power	W	40			
Maximum voltage	V	1000			
Number of inputs		4 inputs (2 MPP trackers)			
Max. current	A	20 (10 x 2)	30 (17 x 2)	30 (20 x 2)	30 (20 x 2)
Overvoltage category [2]		II			
OUTPUT (AC)					
Max. apparent power [3]	kVA	6.3	8.4	10.0	12.6
Nominal apparent power	kVA	6.0	8.0	10.0	12.0
Voltage range (3 phase) [3]	V	3 x 230 / 400 V (± 20 %) + N + PE (3 phases. 5 wires)			
Nominal current	A	8.7	11.6	14.5	17.4
Max. current	A	9.6	12.8	16.0	19.2
Nominal frequency	Hz	50 / 60			
Frequency range [4]	Hz	50 / 60 ± 5			
Power factor adjustable		0.80 cap ... 0.80 ind			
Total harmonic distortion		<3 % nominal apparent power			
DC current injection		<0.5 % rated current			
Night-time loss	W	< 2			
Overvoltage category [2]		III			
GENERAL SPECIFICATION					
Maximum efficiency	%	98.2	98.2	98.3	98.3
EU efficiency	%	97.2	97.4	97.7	97.7
Operating temperature	°C	–25 ... +60	–20 ... +60		
Derating at	°C	> 40			
Storage temperature	°C	-25 ... +70			

		6.0EUT4TL	8.0EUT4TL	10EUG4TL	12EUG4TL
Humidity	%	5 ... 95 (non-condensing)			
Max. Operating Altitude	m	2000			
MECHANICAL DESIGN					
Size (L x W x D)	mm	620 x 625 x 275			
Weight	kg	38	40	40	40
Enclosure		Powder coated aluminum			
Cooling		Fan			
AC connector		Amphenol C16-3			
DC connector pairs		4 MultiContact MC4			
Communication interfaces		2 RJ45/RS485			
DC disconnector		Integrated			
Display		Black / white graphical LCD			
STANDARDS / DIRECTIVES					
Protection degree [5=)]		Cooler area IP55 / electronics IP65			
Safety class		1			
Configurable trip parameters		Yes			
Insulation monitoring		Yes			
Overload behavior		Current limitation, power limitation			
Safety		IEC62109-1 / -2, CE compliance			
Grid Interface		VDE-AR-N 4015, VFR 2013, VFR 2014	VDE-AR-N 4105	VDE-AR-N 4105, VDE 0126-1-1/A1, EN 50438, UTE C15-712-1, VFR 2013, VFR 2014, Synergrid C10/C11 Juni 2012, CEI 0-21	VDE-AR-N 4105
EMC		EN61000-6-2, EN61000-6-3			

[1)] When operated with balanced DC inputs (50/50 %)
[2)] IEC 60664-1, IEC 62109-1
[3)] The maximum AC apparent power indicates the power an inverter is able to deliver. This maximum apparent power may not necessarily be reached.
[3)] AC voltage and frequency range will be programmed according to the individual country requirements.
[5)] IP55 for cooling section / IP65 for electronics

		15EUG4TL	20EUG4TL	30EUT4TL
INPUT (DC)				
Max. recommended PV power [1]	kW_P	19	25	38
Recommended PV power range	kW_P	14 ... 19	18 ... 25	26 ... 38
Nominal power	kW	15.3	20.4	31
Operating voltage	V_{DC}	250 ... 1000		
MPP Voltage range				
Symmetrical load (50/50%)	V_{DC}	350 ... 800	350 ... 800	480 ... 800
Asymmetrical load (67/33%)	V_{DC}			
Asymmetrical load (33/67%)	V_{DC}	470 ... 800	480 ... 800	620 ... 800
Nominal voltage	V_{DC}	650		
Start up power	W	40		
Absolute maximum voltage	V	1000		
Number of inputs		4 inputs (2 MPP trackers)		6 inputs (2 MPP trackers)
Max. current	A	48 (24 x 2)	60 (30 x 2)	68 A (34 x 2)
Overvoltage category [2]		II		
OUTPUT (AC)				
Max. apparent power [3]	kVA	15.75	21.0	30.0
Nominal apparent power	kVA	15.0	20.0	30.0
Voltage range (3 phase) [3]	V	3 x 230 / 400 V (± 20 %) + N + PE (3 phases, 5 wires)		
Nominal current	A	22	29	43
Max. current	A	25	32	46
Nominal frequency	Hz	50 / 60		
Frequency range [4]	Hz	50 / 60 ± 5		
Power factor adjustable		0.80 Cap ... 0.80 Ind		
Total harmonic distortion		< 3 % @ nominal apparent power		
DC current injection		< 0.5 % rated current		
Night-time loss	W	< 2		
Overvoltage category [2]		III		
GENERAL SPECIFICATION				
Maximum efficiency	%	98.0		98.2
EU efficiency	%	> 97.8		> 97.9
Operating temperature	°C	-20 - +60°		
Derating at	°C	> 40		
Storage temperature	°C	-20 - +70		-25 - +70
Humidity	%	5 ... 95		
Max. Operating Altitude	m	2000 m		

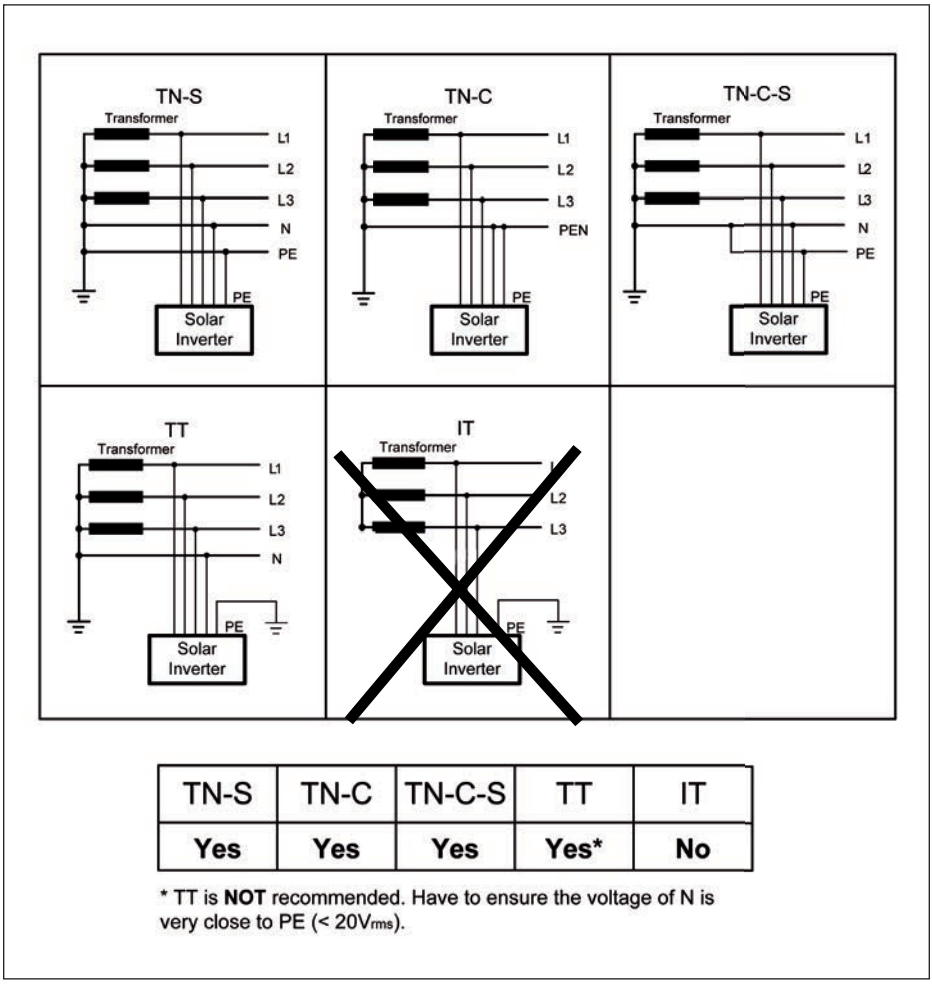
		15EUG4TL	20EUG4TL	30EUT4TL
MECHANICAL DESIGN				
Size (L x W x D)	mm	952 x 625 x 275		
Weight	kg	67.2	67.2	72.2
Enclosure		Powder coated aluminum		
Cooling		Fan		
AC connector		Amphenol C16-3		Amphenol PPC AC 24
DC connector pairs		4 Multicontact MC4		6 Multicontact MC4
Communication interfaces		2 RJ45 / RS485		
DC disconnector		Integrated		
Display		Black / white graphical LCD		
STANDARDS / DIRECTIVES				
Protection degree [5]		Cooler area IP55 / electronics IP65		
Safety class		1		
Configurable trip parameters		Yes		
Insulation monitoring		Yes		
Overload behavior		Current limitation, power limitation		
Safety		IEC62109-1 / -2, CE compliance, AS/NZS 3100		IEC62109-1 / -2, CE compliance
Grid Interface		VDE-AR-N 4105, BDEW, VDE 0126-1-1/A1, G59/1-2 (230V & 240V), EN 50438, UTE C15-712-1, VFR 2013, VFR 2014, Synergrid C10/C11 June 2012, RD661/2007, RD1699/2011, CEI 0-21, French Islands 60 Hz., AS 4777, SONDO Class C		VDE-AR-N 4105, UTE C15 712-1, VFR 2013, VFR 2014 VDE 0126-1-1/A1, CEI 0-21, BDEW, SONDO Class C, Synergrid C10/11 June 2012, EN 50438, G59/1-2 (230V & 240V)
EMC		EN61000-6-2, EN61000-6-3, EN61000-3-11, EN61000-3-12, C-Tick		EN61000-6-2, EN61000-6-3, EN61000-3-11, EN61000-3-12

[1] When operated with balanced DC inputs (50/50 %)
[2] IEC 60664-1, IEC 62109-1
[3] The maximum AC apparent power indicates the power an inverter is able to deliver. This maximum apparent power may not necessarily be reached.
[3] AC voltage and frequency range will be programmed according to the individual country requirements.
[5] IP55 for cooling section / IP65 for electronics

12.2 Cable Recommendations

Power wiring		
Current rating	Cross-section	Recommended max. cable loss calculation
AC - < 40 A (8.0 TL / 10 TL / 12 TL / 15 TL / 20 TL) < 60 A (30 TL)	Calculated based on needed length, used material, cable losses and etc.	<1 %
DC 34 A	6 mm^2	<1 %
Communication cable		
RS485 modular communication cable / cross wired 8 poles		

12.3 Earthing Systems



TN-S	TN-C	TN-C-S	TT	IT
Yes	**Yes**	**Yes**	**Yes***	**No**

* TT is **NOT** recommended. Have to ensure the voltage of N is very close to PE (< 20V_{rms}).

Figure 12.1.: Earthing Systems

12.4 15 TL and 20 TL Models With Earlier DC Input Panel

Please note that 15 TL and 20 TL inverter models have two different DC input connector configurations, while the models are operationally the same and the DC connectors are the same type. Please see the figures below for the layout of the DC inputs for 15 TL and 20 TL models produced before and after September 1, 2012.

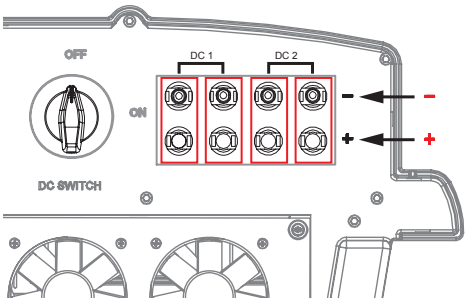


Figure 12.2.: DC Input Panel For Models Before Sept. 1, 2012

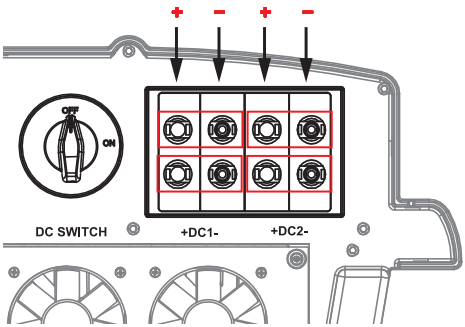


Figure 12.3.: DC Input Panel For Models After Sept. 1, 2012

EC Declaration of Conformity

Producer: Delta Energy Systems (Germany) GmbH
Address: Tscheulinstr. 21, D - 79331 Teningen, Germany

Product description: **Solar Inverter for Grid operation**

Model: **SOLIVIA30EUT4TL** **EOE48030458**

The product described above in the form as delivered is in conformity with the provisions of the following European Directives:

2004/108/EG Council Directive on the approximation of the laws of the Member States relating to electromagnetic compatibility

EN 55014-1 : 2006 + A1 : 2009
EN 61000-3-11 : 2001 + EN 61000-3-12 : 2005
IEC 61000-4-2 : 2008
IEC 61000-4-3 : 2010
IEC 61000-4-4 : 2011
IEC 61000-4-5 : 2005
IEC 61000-4-6 : 2008
IEC 61000-4-8 : 2009
IEC 61000-4-11 : 2004
EN 61000-6-2 : 2005 / EN 61000-6-1 : 2007
EN 61000-6-3 : 2007 / EN 61000-6-4 : 2007

2006/95/EC Council Directive on the approximation of the laws of the Member States related to electrical equipment designed for use within certain voltage limits

IEC 62109-1 : 2010
IEC 62109-2 : 2011

Teningen, November 30th 2012

Vincent Lin		Andreas Hoischen	
Head of Product Management LOB ISPV		Head of BU LOB ISPV	
name, function	signature	name, function	signature

This declaration certifies the conformity to the specified directives but contains no assurance of properties. The safety documentation accompanying the product shall be considered in detail.

EC Declaration of Conformity

Producer: Delta Energy Systems (Germany) GmbH
Address: Tscheulinstr. 21, D - 79331 Teningen, Germany

Product description: **Solar Inverter for Grid operation**

Model: **SOLIVIA15EUG4TL** **EOE48010362**
SOLIVIA20EUG4TL **EOE48010364**

The product described above in the form as delivered is in conformity with the provisions of the following European Directives:

2004/108/EG Council Directive on the approximation of the laws of the Member States relating to electromagnetic compatibility

EN 55014-1 : 2006 + A1 : 2009
EN 61000-3-12 : 2005 + EN 61000-3-11 : 2001
EN 61000-4-2 : 2008
EN 61000-4-3 : 2010
EN 61000-4-4 : 2011
EN 61000-4-5 : 2005
EN 61000-4-6 : 2008
EN 61000-4-8 : 2009
EN 61000-4-11 : 2004
EN 61000-6-2 : 2005 / EN 61000-6-1 : 2007
EN 61000-6-3 : 2007 / EN 61000-6-4 : 2007

2006/95/EC Council Directive on the approximation of the laws of the Member States related to electrical equipment designed for use within certain voltage limits

EN 62109-1 : 2010
EN 62109-2 : 2011

The product described above does also comply with the VDE 0124-100.

Teningen, July 7th 2012

Vincent Lin		Andreas Hoischen	
Head of Product Management LOB ISPV		Head of BU LOB ISPV	
Name, Function	Signature	Name, Function	Signature

This declaration certifies the conformity to the specified directives but contains no assurance of properties. The safety documentation accompanying the product shall be considered in detail.

EC Declaration of Conformity

Producer:	Delta Energy Systems (Germany) GmbH
Address:	Tscheulinstr. 21, D - 79331 Teningen, Germany
Product description:	**Solar Inverter for Grid operation**
Model:	**SOLIVIA8.0EUT4TL EOE47030541**
	SOLIVIA10EUT4TL EOE47030457
	SOLIVIA12EUT4TL EOE48030542

The product described above in the form as delivered is in conformity with the provisions of the following European Directives:

2004/108/EG Council Directive on the approximation of the laws of the Member States relating to electromagnetic compatibility

EN 61000-3-11 : 2001 + EN 61000-3-12 : 2005
IEC 61000-4-2 : 2008
IEC 61000-4-3 : 2010
IEC 61000-4-4 : 2011
IEC 61000-4-5 : 2005
IEC 61000-4-6 : 2008
IEC 61000-4-8 : 2009
IEC 61000-4-11 : 2004
EN 61000-6-2 : 2005 / EN 61000-6-1 : 2007
EN 61000-6-3 : 2007 / EN 61000-6-4 : 2007

2006/95/EC Council Directive on the approximation of the laws of the Member States related to electrical equipment designed for use within certain voltage limits

IEC 62109-1 : 2010
IEC 62109-2 : 2011

Teningen, June 6th 2013

Klaus Gremmelspacher		Andreas Hoischen	
Head of Product Management LOB ISPV	i.V.	Head of BU LOB ISPV	ppa.
name, function	signature	name, function	signature

This declaration certifies the conformity to the specified directives but contains no assurance of properties. The safety documentation accompanying the product shall be considered in detail.

Dezscha SOLIVIA12_8EUT4TL EC_Decl en 20136.doc

Please visit the web site at www.solar-inverter.com to find all applicable certificates for the SOLIVIA TL solar inverters.

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